California Regional Water Quality Control Board
Santa Ana Region

Terry Tamminen
Secretary for Environmental Protection

3737 Main Street, Suite 500, Riverside, California 92501-3348
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http://www.swrcb.ca.gov/rwqcb8

Arnold Schwarzenegger
Governor

February 6, 2004

Virginia Grebbien, General Manager
Orange County Water District
P.O. BOX 8300
Fountain Valley, CA 92728-8300

PRODUCER/USER WATER RECYCLING REQUIREMENTS FOR INTERIM WATER FACTORY 21 AND GROUNDWATER REPLENISHMENT SYSTEM, GROUNDWATER INJECTION AND RECHARGE AT TALBERT GAP SEAWATER INTRUSION BARRIER AND KRAEMER/MILLER RECHARGE BASINS, ORANGE COUNTY WATER DISTRICT, ORANGE COUNTY - ORDER NO. R8-2004-0002

Dear Ms. Grebbien:

Enclosed is a copy of tentative Order No. R8-2004-0002. The tentative Order includes producer/user water recycling requirements for the production of recycled water at the proposed Interim Water Factory 21 and Groundwater Replenishment System and use of the product water for groundwater injection and recharge at the Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller recharge Basins.

This Order is scheduled for consideration by the Regional Board on March 12, 2004. The Board meeting will be held at the Orange County Sanitation District Conference Room (10844 Ellis Avenue, Fountain Valley) starting at 9 a.m. Although all comments that are provided up to and during the public hearing on this matter will be considered, receipt of your comments on the proposed Order by February 23, 2004, would be appreciated so that they can be used in the formulation of the final draft Order which will be transmitted to the Board two weeks prior to the hearing. The final draft Order may contain changes resulting from comments received from you and others. To view and/or download a copy of the final draft Order, please access our website at *http://www.swrcb.ca.gov/rwqcb8* on or after March 1, 2004.

State regulations require that the public be notified of the public hearing regarding these water recycling requirements at least 30 days in advance. Therefore, in order for the Board to consider your waste discharge requirements on March 12, 2004, such notice must be made by February 11, 2004. Two copies of a "Notice of Public Hearing" are enclosed. Please post two copies in conspicuous places in the locality to be affected by the discharge (local post office, library, city hall, or courthouse). By February 23, 2004, you must file with this office proof of posting. Proof of posting shall consist of a statement executed on the enclosed form.

If you have any questions, please contact Jun Martirez (909) 782-3258 or Jane Qiu at (909) 320-2008.

Sincerely,

Joanne E. Schneider
Environmental Program Manager

Enclosures: Order R8-2004-0002, Staff Report, Monitoring and Reporting Program, Notice of Public Hearing, and Statement of Posting Notice

California Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3348

NOTICE OF PUBLIC HEARING

For
Producer/User Water Recycling Requirements
Order No. R8-2004-0002

For
Orange County Water District
Interim Water Factory 21 and Groundwater Replenishment System
Groundwater Recharge and Reuse at
Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins
Orange County

On the basis of preliminary staff review and application of lawful standards and regulations, the California Regional Water Quality Control Board, Santa Ana Region, proposes to issue producer/user water recycling requirements for the production of recycled water at the proposed Interim Water Factory 21 and Groundwater Replenishment System and use of the product water for groundwater injection and recharge at the Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller recharge Basins.

The Board is seeking comments concerning the proposed waste discharge requirements and the potential effects of the discharge on the water quality and beneficial uses of the affected receiving waters.

The Board will hold a public hearing to consider adoption of the proposed waste discharge requirements as follows:

DATE: **March 12, 2004**
TIME: **9:00 a.m.**
PLACE: **Orange County Sanitation District Conference Room**
10844 Ellis Avenue
Fountain Valley, CA

Interested persons are invited to submit written comments on the proposed Order No. R8-2004-0002. Interested persons are also invited to attend and express their views on issues relating to the proposed Order. Oral statements will be heard, but should be brief to allow all interested persons time to be heard. For the accuracy of the record, all testimony (oral statements) should be submitted in writing.

Although all comments that are provided up to and during the public hearing on this matter will be considered, receipt of comments by *February 23, 2004* would be appreciated so that they can be used in the formulation of the final draft Order that will be transmitted to the Board two weeks prior to the hearing. The final draft Order may contain changes resulting from comments received from you and others. To view and/or download a copy of the final draft Order, please access our website at *http://www.swrcb.ca.gov/rwqcb8* on or after *March 1, 2004*.

The Board's proposed Order, related documents, and all comments and petitions received may be inspected and copied at the **Regional Board office, 3737 Main Street, Suite 500, Riverside, CA 92501-3348 ((909) 782-4130)** by appointment scheduled between the hours of 9:00 a.m. and 3:00 p.m., Monday through Friday. Copies of the proposed Order will be mailed to interested persons upon request to *Jane Qiu (909) 320-2008*.

Any person who is physically handicapped and requires special accommodation to participate in this Regional Board Meeting should contact *Catherine Ehrenfeld* at *(909) 782-3285* no later than *February 27, 2004*. Please bring the foregoing to the attention of any person known to you who would be interested in this matter.

Please complete and return this copy by February 16, 2004
TO: Jane Qiu
CRWQCB Region 8
3737 Main Street, Suite 500
Riverside, CA 92501-3348

STATEMENT OF POSTING NOTICE

I, _____, hereby state
(name of person posting the notices)

THAT I am the discharger or acting on behalf of the discharger,

THAT I have posted a copy of the "Notice of Public Hearing" at each of the following locations:

Location 1: _____
(describe how and where)

_____

Date Posted: _____

Location 2: _____
(describe how and where)

Date Posted: _____

THAT the notices were posted in conspicuous places in the locality to be affected by the discharge;

THAT the notices pertained to:

Order No. R8-2004-0002 of the Santa Ana Regional Water Quality Control Board

Discharger: Orange County Water District – Interim Water Factory 21 and Groundwater Replenishment System, Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins

I declare under penalty of perjury that the foregoing is true.

_____
(Signature of person who posted the copies of the notice)

Date: _____

Place: _____

California Regional Water Quality Control Board
Santa Ana Region

March 12, 2004

STAFF REPORT

ITEM: 6

SUBJECT:

Producer/User Water Recycling Requirements, Order No. R8-2004-0002 for Orange County Water District (OCWD) for the production of recycled water at the proposed Interim Water Factory 21 and Groundwater Replenishment System and for the use of the product water for groundwater water recharge at the Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller recharge Basins.

A. SUMMARY

Orange County Water District (hereinafter, OCWD or producer) owns and has operated the Water Factory (WF) 21 for the production and use of recycled water to maintain the Talbert Gap Seawater Intrusion Barrier (Talbert Gap Barrier). WF-21, in operation since 1975, was a 15 million gallons per day (mgd) advanced tertiary treatment plant that produced recycled water that met the California Department of Health Services (CDHS) requirements for injection into the Talbert Gap Barrier. The Barrier prevents the inflow of seawater into the groundwater basin, which is used as a source of domestic water supply. WF-21 is located at 10500 Ellis Avenue in Fountain Valley. The Talbert Gap Barrier consists of pipelines and injection wells, primarily located along Ellis Avenue in Fountain Valley and Huntington Beach. (See Attachment 2 of this Staff Report). The WF 21 and Talbert Gap Barrier project are currently regulated under Regional Board Order No. 91-121, as amended by Orders No. 93-28 and No. 93-74.

In February 2002, OCWD submitted a Report of Waste Discharge (ROWD) to the Regional Board for production/use of recycled water from WF 21 and the proposed Interim WF 21. In October 2003, OCWD submitted a revised ROWD for the production and use of recycled water from the proposed Interim WF 21 and from the Groundwater Replenishment System (GWRS). WF 21 was not included in the revised ROWD in anticipation of its removal from service. WF 21 was taken out of service in January 2004. Interim WF 21 is the WF 21 facilities modified in order to maintain recycled water production to supply the Talbert Gap Barrier during construction of the GWRS.

The GWRS is a joint project by OCWD and the Orange County Sanitation District (OCSD). OCWD is the lead agency for the proposed project. The purpose of GWRS is to augment the existing recycled water supply by providing a more reliable and higher quality source of water for recharge, irrigation, and industrial uses and for protection of the Orange County Groundwater Basin from further degradation due to seawater intrusion. The GWRS will also provide peak wastewater flow disposal relief and postpone the need for OCSD to construct a new ocean outfall by diverting treated wastewater flows that would otherwise be discharged to the Pacific Ocean.

The GWRS will consist of three major components: (1) advanced water treatment facilities (AWTF) and pumping stations; (2) expansion of the Talbert Gap Barrier; and (3) construction of a major pipeline connecting the treatment facilities to existing recharge basins (the Kraemer and Miller basins) in Anaheim (See Attachment 1 to this Staff Report). OCSD will provide secondary treated wastewater from its Reclamation Plant No. 1 to the GWRS for advanced treatment. The GWRS will treat the secondary wastewater to meet drinking water standards and other limits imposed on recycled water intended for groundwater recharge and indirect potable reuse.

Implementation of the GWRS will be phased. The first phase will produce up to 70 million gallons per day (MGD) of recycled water. Future phases to expand the capacity of the GWRS are possible. Approximately half of the recycled water produced will be injected at the Talbert Gap Barrier and the remainder will be spread at the Kraemer/Miller recharge basins. Kraemer Basin will be the primary recharge basin receiving recycled water. The adjacent Miller Basin will be used on a standby basis when Kraemer Basin is taken out of service periodically for cleaning. A minor amount of the GWRS product water may be used occasionally to supplement the Green Acre Project (GAP)[1] for irrigation and industrial uses. During start-up conditions, the GWRS will discharge to the OCSD outfall via a valved piping connection. During peak flow and/or emergency events, the fully operational GWRS will discharge up to 100 mgd of tertiary treated and disinfected recycled water to the Santa Ana River[2].

The GWRS Advanced Water Treatment Facilities (AWTF) will replace WF 21/Interim WF 21 and be located at the same site in Fountain Valley. The Interim WF 21 facilities will be similar to the GWRS AWTF. The Interim WF 21 will produce up to 5 mgd of recycled water for direct injection into the Talbert Gap Barrier. Interim WF21 recycled water will not be discharged to recharge basins. When construction of the GWRS nears completion, the Interim WF 21 will be taken out of service and certain of its components will be relocated to the GWRS AWTF. The Talbert Gap Barrier will be expanded towards the west along Ellis Avenue in Huntington Beach and towards the southeast along Ward Street and the westerly side of the Santa Ana River to Adams Avenue in Fountain Valley. The GWRS Pipeline will be installed along the westerly levee of the Santa Ana River from the AWTF to the Kraemer/Miller recharge basins.

OCWD has operated a 0.43 mgd capacity demonstration project since January 1997 that utilizes the same treatment processes, including microfiltration (MF) and reverse osmosis (RO), as those proposed for the GWRS and Interim WF 21. In addition, OCWD has conducted a pilot advanced oxidation process (AOP) using hydrogen peroxide and UV studies at the demonstration project. The water quality produced by the demonstration project is representative of that anticipated from the GWRS and Interim WF 21. Water quality data from the demonstration project indicate that the GWRS and Interim WF 21 recycled water will meet all requirements of the California Drinking Water Primary and Secondary Maximum Contaminant Levels (MCLs). Data from the demonstration project have also indicated that selected pharmaceutically-active compounds and other toxic contaminants not included in the drinking water standards are removed or reduced to low levels in the product water.

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[1] *This is another recycling project implemented by OCWD.*

[2] *A separate NPDES Order will be necessary to regulate this discharge.*

In conformance with State regulations pertaining to the use of recycled water, OCWD submitted to the CDHS a Title 22 Engineering Report for the GWRS in September 2000. In August 2001, OCWD submitted to the CDHS Addenda Nos. 1, 2, 3, and 4 to the Engineering Report to provide responses to CDHS' comments on the Engineering Report. In March 2003, OCWD submitted to the CDHS responses to CDHS' comments on the Addenda.

The CDHS conducted multiple meetings and discussions with OCWD about this proposed groundwater recharge/reuse project. On February 4, 2003, CDHS held a public hearing in Fountain Valley, California, to consider the GWRS. A summary of that public hearing is included in this Order as Attachment A. This summary includes "Findings of Fact" and "Conditions". On July 28, 2003, CDHS sent a letter with the "Findings of Fact" and "Conditions" to the Regional Board. CDHS found that the proposed operation of the GWRS and Interim WF 21 would not degrade the quality of the water in the receiving aquifers as a source of domestic water supply, provided that OCWD meets all of the conditions stipulated in Attachment A. These conditions include the implementation of a comprehensive monitoring program by OCWD to ensure that the recycled water produced at the GWRS AWTF for recharge into the groundwater basin via injection at the Talbert Gap Barrier and spreading at the Kraemer/Miller basins meets water quality requirements. The conditions also include the requirement to develop and periodically update an operating plan for the facilities.

The CDHS recommended that the Regional Board incorporate all of the "Findings of Fact" and "Conditions" into the water recycling requirements to be issued to OCWD for the production/use of recycled water from Interim WF 21 and the proposed GWRS. This Order implements that CDHS recommendation. The Findings of Fact are incorporated in Attachment A to the Order. The Order requires the producer to satisfy the Conditions outlined in Findings of Fact by CDHS, with certain modifications based on discussions with CDHS' and the producer. To the extent of any conflict between this Order and the CDHS "Conditions", the requirements of this Order shall govern.

B. DESCRIPTION OF OCWD RECYCLED WATER TREATMENT FACILITIES

The WF 21, proposed Interim WF 21 and proposed GWRS facilities are described below.

WF 21: The WF 21 was originally designed nearly three decades ago to provide advanced tertiary treatment of up to 15 mgd of secondary treated municipal wastewater from the OCSD Fountain Valley Reclamation Plant No. 1. WF 21 treated the secondary treated wastewater by using lime clarification, recarbonation, mixed media filtration, reverse osmosis (RO), advanced oxidation/disinfection (hydrogen peroxide and ultraviolet UV treatment), and chlorination. OCWD installed and operated the hydrogen peroxide addition and ultraviolet irradiation system in September 2001 as part of the demonstration studies. OCWD also modified its treatment processes to minimize the formation of N-Nitrosodimethylamine (NDMA) and 1,4 dioxane in the recycled water and to remove these constituents effectively. Most recently, to minimize NDMA and 1,4 dioxane production, the WF 21 produced only up to 5 mgd of treated water. As previously noted, WF 21 was taken out of service in January 2004. (See Attachment 3 of this Staff Report.)

INTERIM WF 21: During construction of the GWRS, portions of the WF 21 facilities will be replaced or modified in order to maintain recycled water production. The modified facilities will be known as Interim WF 21 and will be similar to the GWRS AWTF. The existing lime clarification, recarbonation, and filtration facilities will be replaced with a microfiltration (MF) system to provide pretreatment for the reverse osmosis (RO) process. In addition, the existing cellulose acetate RO membranes will be changed to new thin film composite polyamide RO membranes. A new ultra-violet light (UV) disinfection unit will be installed for demonstration and certification testing. During this testing, the existing UV system will continue to operate. The new UV system will not be placed in operation as the primary disinfection process until approval has been obtained from CDHS. The treatment process train for the Interim WF 21 will be comprised of MF, RO, advanced oxidation process (AOP) that includes hydrogen peroxide addition and UV irradiation. The Interim WF 21 will produce up to 5 mgd of advanced tertiary treated water. (See Attachment 4 to this Staff Report) When construction of GWRS nears completion, the Interim WF 21 will be taken out of service, and portions of its MF, RO, and UV components will be relocated to the GWRS AWTF.

GROUNDWATER REPLENISHMENT SYSTEM (GWRS) ADVANCED TREATMENT FACILITIES (AWTF):

The AWTF includes the following (See Attachment 5 to this Staff Report)**:**

1. **Fine Screening:** Secondary treated wastewater from OCSD's Reclamation Plant No. 1 will be strained, or passed through rotating band fine-mesh screens, and chloraminated prior to microfiltration. Screenings will be dewatered and returned to OCSD for disposal.

2. **Microfiltration:** Screened secondary effluent will flow via gravity to 26 in-basin microfiltration (MF) cells containing submerged racks of hollow fiber membranes with a maximum pore size of 0.2 micron. This MF system has been accepted by CDHS as an approved alternative to media filtration. The nominal rated filtrate production capacity of the MF system will be 86 mgd. The waste backwash will be returned to OCSD for treatment.

3. **Reverse Osmosis:** Stored MF filtrate will be pumped from the MF break tank to the reverse osmosis (RO) system. Upstream of the RO process, the flow will be pretreated by adding sulfuric acid for pH control and threshold inhibitor to prevent precipitation of sparingly soluble salts, and by 10-micron cartridge filtration. Each of the 15 RO trains will have a capacity of 5 mgd. Designed for an 85% recovery rate, the nominal permeate production capacity of the RO system will be 70 mgd. Permeate from the RO system will be discharged to the advanced oxidation and ultraviolet light treatment/disinfection processes. The waste brine from the RO system will be discharged to OCSD's effluent discharge line for disposal to the ocean.

4. **Advanced Oxidation/Disinfection:** The advanced oxidation process (AOP) will consist of two steps. First, hydrogen peroxide will be added to the RO permeate upstream of the ultraviolet (UV) light treatment. Second, UV irradiation will be used for disinfection and reduction of light-sensitive contaminants. Hydrogen peroxide exposed to UV irradiation produces hydroxyl radicals that result in advanced oxidation to destroy UV-resistant contaminants, such as N-nitrosodimethylamine (NDMA). The AOP system is designed to disinfect RO permeate and reduce NDMA levels to a concentration below 10 parts per trillion (ppt). The total nominal capacity of the duty UV system is 70 mgd. The nominal capacity of the standby/peak flow UV system is 30 mgd. In the event that more than 30 mgd of peak/emergency flow needs to be discharged to the river, then recycled water production will be stopped. Up to 100 mgd of filtered, disinfected effluent would be discharged to the Santa Ana River under appropriate waste discharge requirements.

5. **Decarbonation:** Under normal recycled water production, following UV treatment, part of the water will pass through decarbonators to releases excess carbon dioxide.

6. **Lime Stabilization:** Lime will be added to the final product water to adjust the pH and reduce the potential for minerals to be leached from the cement lining used in the transmission pipelines.

The CDHS has found that the proposed GWRS project complies with the Water Recycling Criteria specified in the California Code of Regulations, Title 22, Division 4, Chapter 3. CDHS considers the AWTF processes described above to be the best available advanced wastewater and recycled water treatment technology at this time. (See Attachment A of the Order, page 5, #4.)

Project schedule: WF 21 was taken out of service in January 2004. When construction of the interim use MF facilities is complete, the existing lime clarification facilities will be demolished and the Interim WF 21 will begin operation. The Interim WF 21 will be in service for only about three years during construction of the AWTF component of the GWRS, or until late 2006 to early 2007. In Spring 2007, the equipment from Interim WF 21 will be relocated to become part of the GWRS AWTF. The remaining WF 21 facilities will be demolished in 2007. Operational testing and start-up of the GWRS AWTF is expected to begin in late 2007.

C. PROCESSES IMPLEMENTED AT OCSD

To assure that the highest water quality will be produced at the GWRS, OCSD will implement the following:

Source Control: OCSD currently implements a comprehensive industrial pretreatment and source control program approved by the Regional Board to control the quality of discharges from point sources into the wastewater collection system. The focus of this program is to address toxic chemicals that might adversely affect the treatment facilities and/or the environment. Per the conditions specified by the CDHS (see Attachment A of the Order), this program will be

expanded to include contaminants that may be harmful to human health and drinking water supplies.

Secondary Treatment: Wastewater treated at OCSD's Reclamation Plant No. 1, which features preliminary, advanced primary, and secondary treatment processes, will be used at the OCWD facilities. The existing rated capacity of Plant No. 1 is 108 mgd. Preliminary treatment consists of barscreens and grit removal. Primary treatment consists of coagulant addition and sedimentation. Following primary clarification, the primary effluent flow stream is split and oxidized using two secondary treatment processes, activated sludge and trickling filters. Secondary clarifiers at the activated sludge system and tricking filters produce fully oxidized and clarified secondary effluent. This secondary effluent will be the source water supplied to the AWTF of the GWRS and Interim WF 21. The GWRS source water will not include flows from the Santa Ana River Interceptor Line, which contains inland brines and industrial wastes.

D. GROUNDWATER RECHARGE AND REUSE

The Orange County Groundwater Basin consists of multiple aquifers that extend over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits. Near the ground surface are shallow aquifers: Talbert, Alpha, Beta, Lambda and Upper Rho Aquifers. The majority of the Basin production is from the principal aquifer system: Lower Rho and Main Aquifers. Deeper aquifers exist below the principal aquifer system; however, these zones contain colored water and currently yield limited production. The Newport-Inglewood Fault Zone forms the southwestern boundary between the Basin and ocean of all but the shallowest aquifers in the Basin. The areas where the shallow aquifers are adjacent to the ocean are known as gaps and are susceptible to seawater intrusion. The Basin is impacted by many variables including factors that are some distance from the proposed project. Some of these include drought, pumping patterns and volumes, new and existing extraction projects, and amount of recharge.

OCWD has operated the Talbert Gap Barrier since 1975 by injecting recycled water produced by WF 21 to prevent seawater intrusion into the fresh water aquifers underlying the central coastal zone of Orange County. OCWD will continue to maintain the Talbert Gap Barrier by injecting recycled water produced by Interim WF 21 and GWRS. Domestic water from City of Fountain Valley and colored water from deep aquifer wells have also been injected into the Talbert Gap Barrier. The amount of recycled water injected has historically ranged between about 900 and 8,000 acre-feet per year. The majority of injected water flows inland to replenish the Basin aquifers, which are a source of municipal water supplies. The failure to maintain an effective seawater intrusion barrier would cause serious water quality degradation in drinking water aquifers in Orange County and the potential loss of this water resource.

The Talbert Gap Barrier consists of 26 existing injection wells, plus two new injection wells currently under construction. Of these 28 injection wells, 24 inject into shallow aquifers, three inject into the Main Aquifer, and one injects into both the shallow and Main aquifers.

The GWRS will add eight new injection wells that will inject into the shallow and Main aquifers. Four of these new wells at the west end of Talbert Gap Barrier will inject into the Alpha, Beta, Lambda, and Main Aquifers. The other four new wells at the east end of the barrier will inject into the Talbert and Lambda Aquifers.

At the Talbert Gap Barrier, OCWD proposes a phased approach that will lead to injection of 100 percent recycled water. Initially, a blend of up to a maximum of 75% recycled water and 25% water of non-wastewater origin will be injected at the barrier. Diluents will be potable water for GWRS and a blend of potable and deep aquifer (colored) water for Interim WF 21. After the GWRS demonstrates compliance with CDHS criteria for recycled water quality and groundwater quality at this initial level for at least one year after the blended recharged water has reached at least one monitoring well, the proposed plan would increase the recycled water contribution up to 100 percent, upon CDHS approval. These percentages will be calculated based on the running monthly-average recycled water contribution for the preceding period up to 60 months.

Potable water for injection into the Talbert Gap Barrier will be supplied via a new pipeline (Southeast Barrier Pipeline) connecting the Metropolitan Water District of Southern California (MWD) OC44 turnout to the barrier pipeline along Ellis Avenue using a reduced pressure principle backflow prevention device. During the initial 75:25 blend phase for GWRS, the Southeast Barrier Pipeline will deliver potable water to the barrier. The new easterly injection wells, which are located adjacent to the Southeast Barrier Pipeline, will receive potable water and the balance will be distributed to the other injection wells for the blend. When injection of 100% recycled water is approved, the OC44 connection will be severed, and this pipeline will be used to deliver recycled water to the new easterly injection wells.

During operation of Interim WF 21, between 3 and 8 mgd of potable water for injection into the Talbert Gap Barrier will be supplied via the MWD OC44 connection as described above, plus between 2 and 5 mgd of potable water via the existing City of Fountain Valley service connection. The Fountain Valley supply is introduced into the existing WF 21 blending reservoir via an air gap. In addition to these diluents, up to 8 mgd of deep aquifer (colored) water will be introduced into the existing WF 21 blending reservoir. From the reservoir, the existing WF 21 pump station will discharge a blend of recycled water, potable water, and deep aquifer water to the Talbert Gap Barrier.

The Interim WF 21 product water will be discharged to the Talbert Gap Barrier and will not be discharged to the Kraemer/Miller spreading basins.

When GWRS becomes operational, OCWD proposes to recharge via spreading a blend of up to a maximum of 75% recycled water and 25% diluent water at the Kraemer/Miller basins. Recycled water will be recharged primarily at Kraemer Basin and occasionally at Miller Basin. Diluents will include water of non-wastewater origin, such as captured Santa Ana River storm flows and imported water purchased from MWD that will be recharged at nearby OCWD spreading basins. These percentages will be calculated based on the running monthly-average recycled water contribution for the preceding period up to 60 months.

E. CDHS RECOMMENDED MINIMUM RETENTION TIMES AND HORIZONTAL DISTANCE SEPARATIONS FOR GROUNDWATER RECHARGE WITH RECYCLED WATER

To assure that any pathogenic microorganisms that may be present in the recycled water are effectively inactivated or removed, the CDHS has determined that a retention time in the Talbert Gap Barrier area of at least 12 months for the recycled water in the groundwater basin before the water is extracted for drinking purposes, and a minimum horizontal separation of 2,000 feet between the Talbert Gap Barrier injection wells and all drinking water wells, are needed. A retention time in the area of the Kraemer/Miller Basins of at least 6 months and a minimum separation of 500 feet between the Basins and any drinking water wells are needed.

The closest active domestic well to the Talbert Gap Barrier is Mesa Consolidated Water District's Well No. MCWD-5. Well MCWD-5 is located approximately 3,100 feet from the Talbert Gap Barrier. The retention time prior to extracting water of recycled water origin at this well is estimated at 24 months.

Groundwater tracer studies were conducted for OCWD by Lawrence Livermore National Laboratory in the area including and downgradient from the Kraemer/Miller Basins. These tracer studies demonstrated that water percolated at Kraemer/Miller Basins travels toward the west/southwest away from Anaheim Lake. This demonstrated that the domestic water production wells closest to the Basins (A-27, A-28, A-42, A-43 and A-44 (all owned and operated by the City of Anaheim)) are upgradient from the Kraemer/Miller Basins and therefore, would not be impacted by the GWRS. These wells are replenished from different, upgradient sources.

The tracer studies demonstrated that water percolated at the Kraemer/Miller Basins would flow toward the west/southwest, towards existing active domestic production wells SCWC-PLJ2 and A-26, owned and operated by the Southern California Water Company and the City of Anaheim, respectively. Domestic water well SCWC-PLJ2 is located approximately 5,3000 feet from Kraemer Basin, while well A-26 is located about 7,800 feet from that Basin. The estimated retention times for recharge water from Kraemer Basin are 6 months to well SCWC-PLJ2 and 8 months to well A-26. Because the arrival time to well SCWC-PLJ2 is roughly equivalent to the six-month minimum retention requirement, well SCWC-PLJ2 will be taken out of service and replaced.

It is essential to assure that new drinking water wells are constructed outside the areas required to achieve the minimum retention times and horizontal separation distances identified by CDHS for both the Talbert Gap Barrier and the Kraemer/Miller Basins. OCWD will adopt a resolution(s) that effectively prevents the use of groundwater for drinking water purposes within the buffer zones in the area of the Barrier and the Basins. The resolution will be invoked and in place prior to the start of recharge of recycled water from the GWRS system.

F. GROUNDWATER MONITORING WELLS

As stated previously, the Conditions stipulated by CDHS for approval of the GRWS project include the requirement for implementation of a comprehensive monitoring program. This program includes monitoring wells at intervals between injection wells and spreading area to extraction wells.

To monitor the Talbert Gap Barrier area, OCWD has installed 16 monitoring wells along Ellis Avenue. OCWD will construct three new multi-depth monitoring wells between the Talbert Gap Barrier injection wells and the nearest domestic water supply wells.

For the Kraemer/Miller basins, OCWD has installed 4 monitoring wells and will install one new multi-depth monitoring well at west of Kraemer/Miller Basins along the groundwater flow path towards domestic water supply well A-26. After well SCWC-PLJ2 is taken out of service, it will be used for monitoring purposes, as it is located about three-quarters of the distance between Kraemer/Miller Basins and well A-26.

Additional detail concerning the monitoring program requirements is included in Attachment A of the Order.

G. REGULATORY BASIS FOR PRODUCER/USER WATER RECYCLING REQUIREMENTS:

Section 13540(b)(1) of the California Water Code provides that recycled water may be injected by a well into a water-bearing stratum, provided that (1) the Regional Board finds that water quality considerations do not preclude controlled recharge of the stratum by direct injection, and (2) the CDHS, following a public hearing, finds that the proposed recharge will not degrade the quality of water in the receiving aquifer as a source of water supply for domestic purposes. As described above, CDHS conducted the requisite hearing on February 4, 2003 and concluded that the recharge will not degrade receiving water quality, provided that certain conditions are met.

Section 13523 of the California Water Code provides that each Regional Board, after consulting with and receiving recommendations from the CDHS and any interested party who has requested in writing to be consulted, and after any necessary hearing, shall prescribe water recycling requirements for water that is used or proposed to be used as reclaimed water, if in the judgment of the Board, it is necessary to protect the public health, safety, or welfare. In order to assure the protection of public health and the use of the groundwater as a source of domestic water supply, it is appropriate for the Regional Board to prescribe water recycling requirements for Interim WF 21 and the GWRS.

This Order includes requirements that implement the Water Quality Plan (Basin Plan), which was adopted by the Regional Board on March 11, 1994. The Basin Plan was approved by the Office of Administrative Law and became effective on January 24, 1995. The Basin Plan specifies water quality objectives and beneficial uses for the groundwater and surface waters of the Santa Ana Region.

The injection wells overlie the Santa Ana Pressure Groundwater Subbasin, while the spreading area overlies the Santa Ana Forebay Groundwater Subbasin. The beneficial uses of these subbasins include municipal and domestic supply, agricultural supply, industrial service supply, and industrial process supply.

The limitations contained in the proposed Order are intended to protect these uses and maintain water quality in these Subbasins. Since domestic supply is a beneficial use, limitations are based on CDHS' primary and secondary drinking water standards, MCLs in the Drinking Water Quality and Monitoring Requirements, California Code of Regulations (CCR), Title 22, Chapter 15, and Basin Plan objectives. The proposed limits on total nitrogen, total organic carbon, total coliform, turbidity, action levels for lead and copper, and other regulated and unregulated constituents are based on CDHS' recommendations stipulated in the "Conditions" of the "Summary of Public Hearing" document resulting from the public hearing conducted by CDHS on February 4, 2003 for the GWRS.

The requirements stipulated in the proposed Order should be adequate to protect the beneficial uses of the receiving waters of the area.

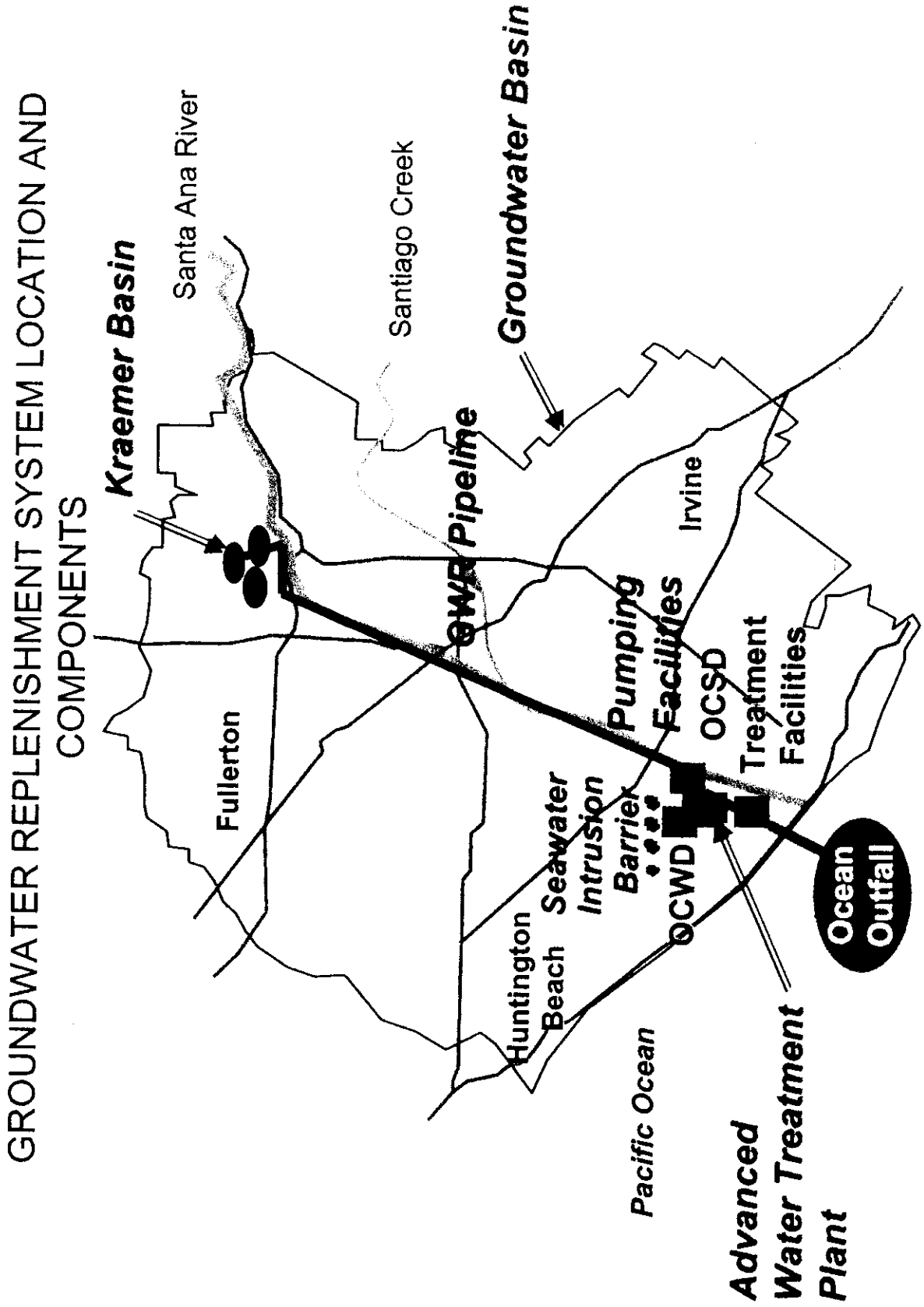
RECOMMENDATION:

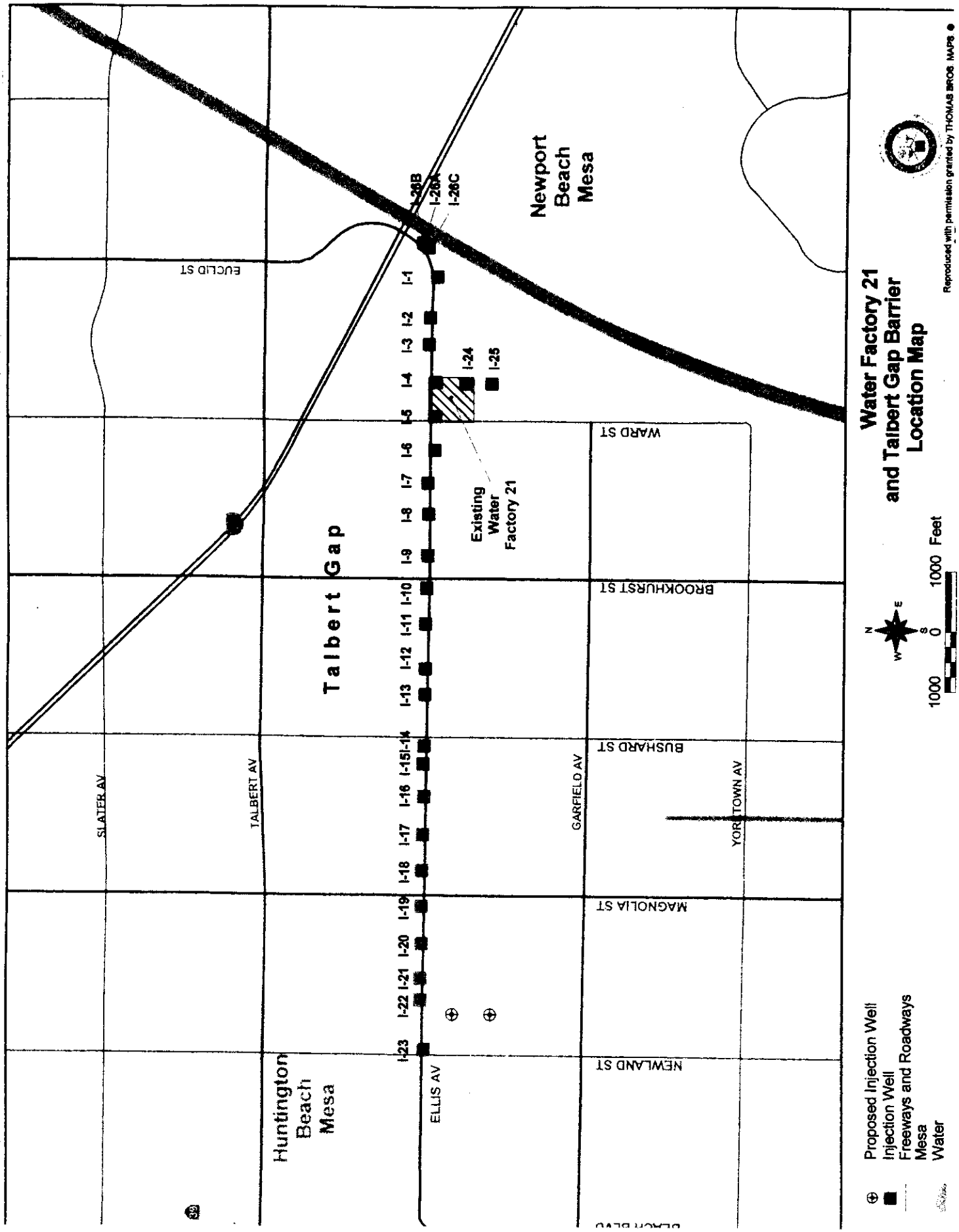
Adopt Order No. R8-2004-0002, as presented

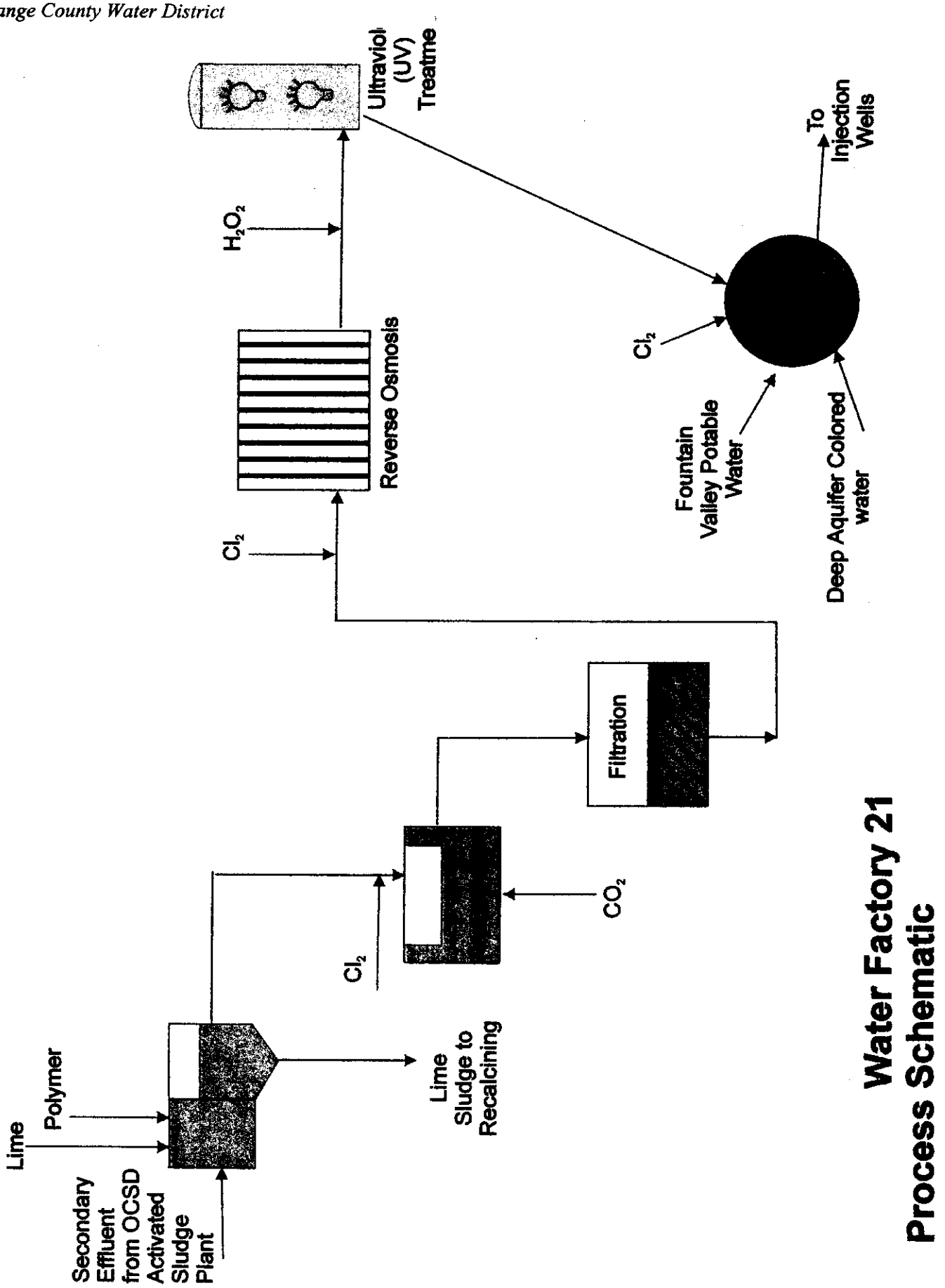
Comments were solicited from the following agencies:

State Water Resources Control Board, Office of the Chief Counsel – Jorge Leon
State Water Resources Control Board, Division of Water Quality- James Maughan
State Water Resources Control Board, Division of Financial Assistance - Diana Robles
State Department of Water Resources - Glendale
California Department of Health Services, Fresno - Cindy Forbes
California Department of Health Services, Carpenteria – John Curphey
California Department of Health Services, Carpenteria – Jeff Stone
California Department of Health Services, Santa Ana – Cor Shaffer
California Department of Health Services, Sacramento - Bob Hultquist
State Department of Fish and Game - Long Beach
Orange County Sanitation District - Robert P. Ghirelli
Southern California Association of Governments – Mark A. Pisano
South Coast Air Quality Management District - James Lents
Orange County Resources Development Management Department
Orange County Health Care Agency

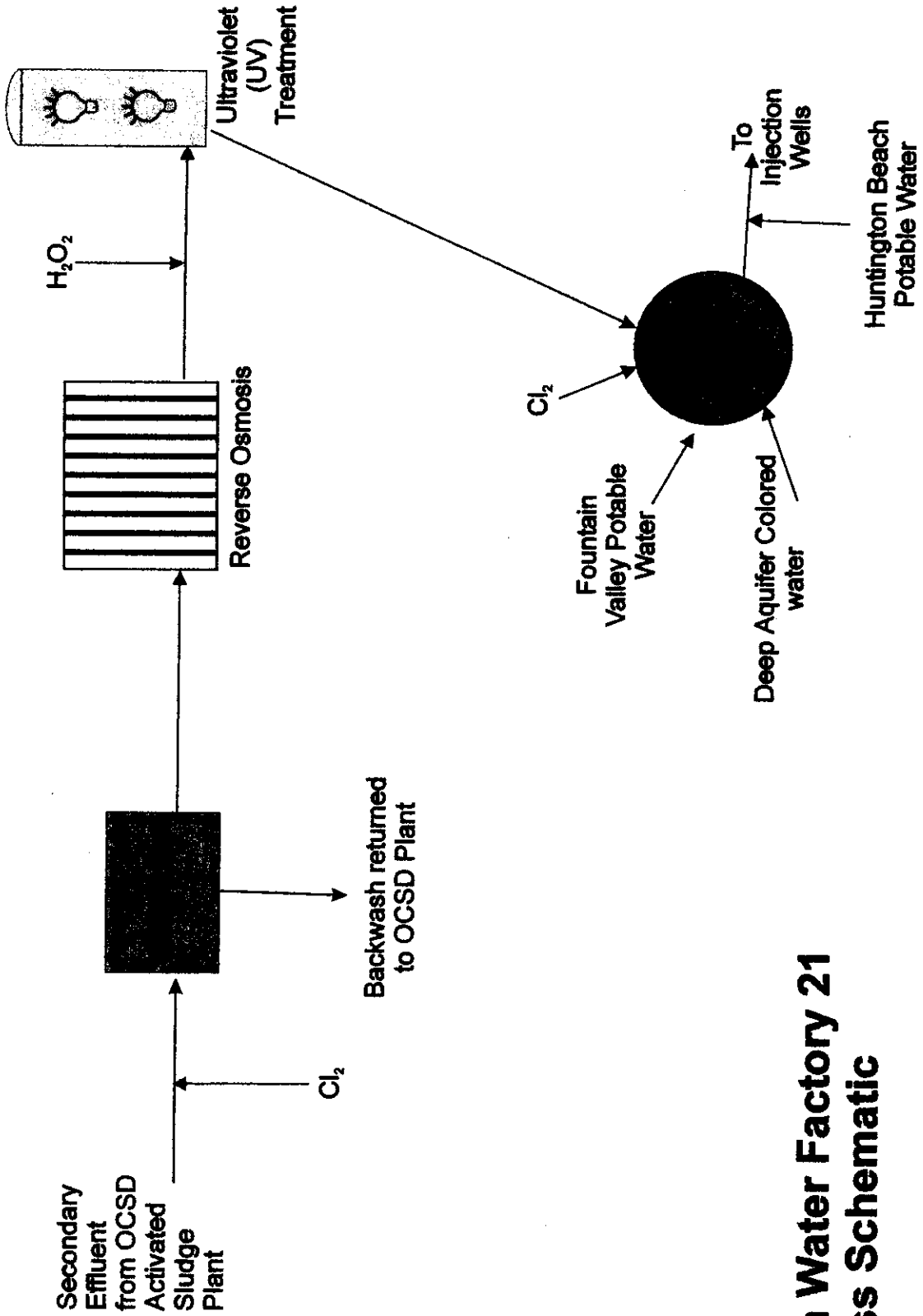
City of Fountain Valley - City Manager
DDB Engineering - Debbie Burris
Jeannie Heimberger, City of Fountain Valley
Jack Skinner, Newport Beach
Bob Caustin, Defend the Bay, Newport Beach
Dennis Baker, Corona Del Mar
Irwin Haydock, Fountain Valley
Larry Porter, Newport Beach
Gerhardt Van Drie- El Segundo
Don Schulz - Surfrider Foundation, H.B./Seal Beach Chapter


GROUNDWATER REPLENISHMENT SYSTEM LOCATION AND COMPONENTS
Kraemer Basin
Santa Ana River
Santiago Creek
Groundwater Basin
GWR Pipeline
Irvine
Pumping Facilities
OCSD Treatment Facilities
Fullerton
Seawater Intrusion Barrier
OCWD
Huntington Beach
Ocean Outfall
Pacific Ocean
Advanced Water Treatment Plant

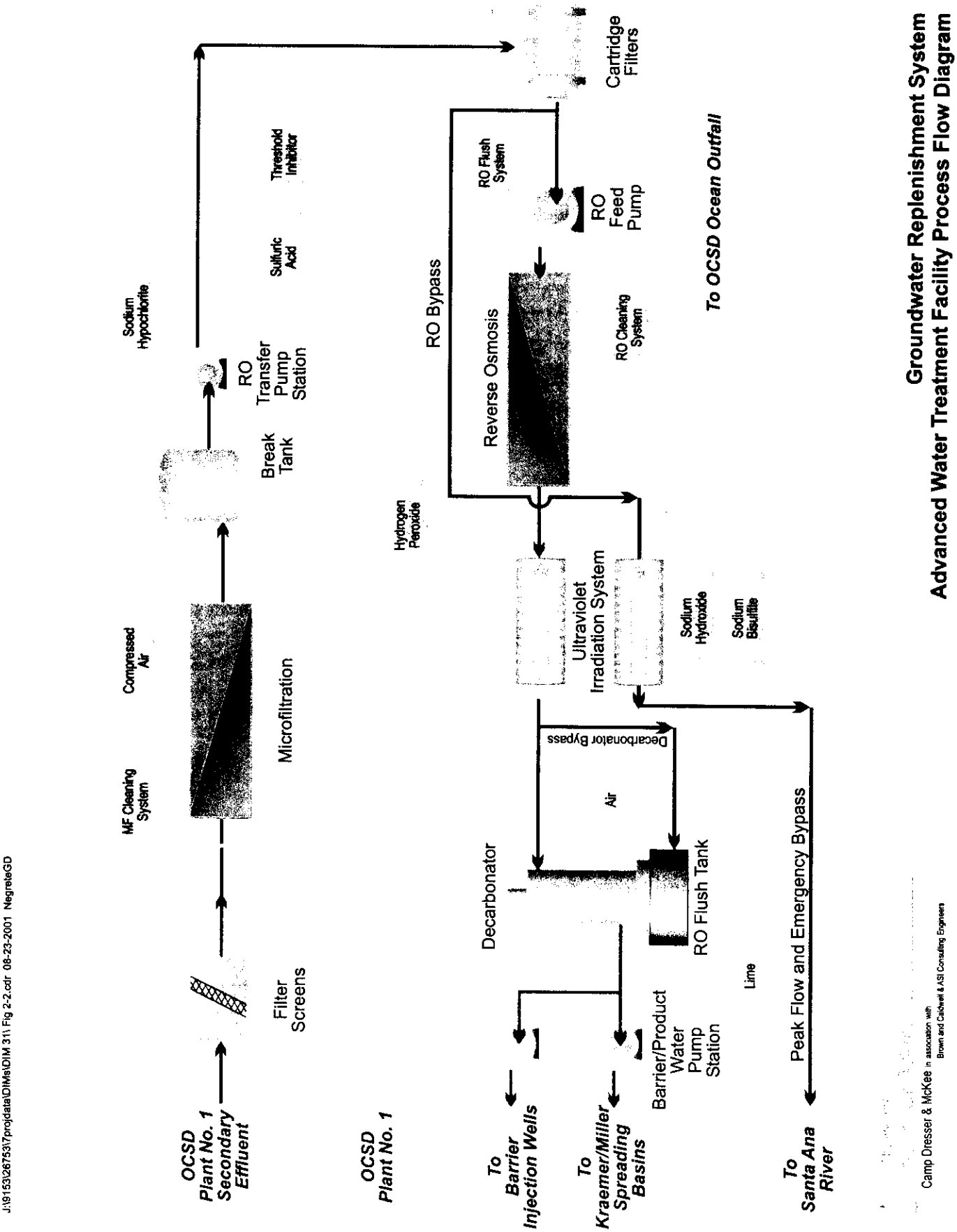

Water Factory 21
and Talbert Gap Barrier
Location Map
Talbert Gap
Newport
Beach
Mesa
Huntington
Beach
Mesa
Existing
Water
Factory 21
I-1
I-2
I-3
I-4
I-5
I-6
I-7
I-8
I-9
I-10
I-11
I-12
I-13
I-14
I-15
I-16
I-17
I-18
I-19
I-20
I-21
I-22
I-23
I-24
I-25
I-26A
I-26B
I-26C
EUCLID ST
WARD ST
BROOKHURST ST
BUSHARD ST
MAGNOLIA ST
NEWLAND ST
SLATER AV
TALBERT AV
GARFIELD AV
YORKTOWN AV
ELLIS AV
1000 0 1000 Feet
Proposed Injection Well
Injection Well
Freeways and Roadways
Mesa
Water
Reproduced with permission granted by THOMAS BROS. MAPS



Water Factory 21
Process Schematic



Interim Water Factory 21
Process Schematic


OCSD Plant No. 1 Secondary Effluent
Filter Screens
Microfiltration
MF Cleaning System
Compressed Air
Break Tank
RO Transfer Pump Station
Sodium Hypochlorite
Sulfuric Acid
Threshold Inhibitor
OCSD Plant No. 1
RO Bypass
Reverse Osmosis
RO Cleaning System
RO Flush System
RO Feed Pump
Cartridge Filters
To OCSD Ocean Outfall
Hydrogen Peroxide
Ultraviolet Irradiation System
Sodium Hydroxide
Sodium Bisulfite
Decarbonator Bypass
Decarbonator
Air
RO Flush Tank
Lime
To Barrier Injection Wells
To Kraemer/Miller Spreading Basins
Barrier/Product Water Pump Station
Peak Flow and Emergency Bypass
To Santa Ana River
Groundwater Replenishment System
Advanced Water Treatment Facility Process Flow Diagram
Camp Dresser & McKee in association with Brown and Caldwell & ASI Consulting Engineers
J:\9153\26753\7proj\data\DIMs\DIM 311 Fig 2-2.cdr 08-23-2001 NegreteGD

California Regional Water Quality Control Board
Santa Ana Region

ORDER NO. R8-2004-0002

Producer/User Water Recycling Requirements

for the

Orange County Water District

Interim Water Factory 21 and Groundwater Replenishment System
Groundwater Recharge and Reuse at
Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins

Orange County

California Regional Water Quality Control Board
Santa Ana Region

ORDER No. R8-2004-0002

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California Regional Water Quality Control Board
Santa Ana Region

Order No. R8-2004-0002

Producer/User Water Recycling Requirements
For
Orange County Water District

Interim Water Factory 21 and Groundwater Replenishment System
Groundwater Recharge and Reuse at
Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins
Orange County

The California Regional Water Quality Control Board, Santa Ana Region (hereinafter Regional Board), finds that:

1. Orange County Water District (hereinafter, OCWD or producer) owns and has operated Water Factory (WF) 21 for the production and use of recycled water to maintain the Talbert Gap Seawater Intrusion Barrier (Talbert Gap Barrier). The WF 21 and Talbert Gap Barrier project is currently regulated under Order No. 91-121, as amended by Orders No. 93-28 and 93-74, which were adopted by the Regional Board on November 15, 1991, April 23, 1993, and December 3, 1993, respectively.

2. In February 2002, OCWD submitted a Report of Waste Discharge (ROWD) for the production/use of recycled water from the existing WF 21 and proposed Interim WF 21. In October 2003, OCWD submitted a revised ROWD for production/use of recycled water from the proposed Interim WF 21 and the proposed Groundwater Replenishment System (GWRS).

3. WF-21 is located at 10500 Ellis Avenue, Fountain Valley, Orange County. WF 21 was an advanced wastewater treatment plant originally designed nearly three decades ago to provide advanced tertiary treatment of up to 15 million gallons per day (mgd) of secondary treated municipal wastewater from the Orange County Sanitation District (OCSD) Fountain Valley Reclamation Plant No. 1. WF 21 was taken out of service in January 2004. WF-21 produced highly treated wastewater that meets the California Department of Health Services (CDHS) requirements for injection into the Talbert Gap Barrier[1] to prevent the inflow of seawater into the groundwater basin, which is used as a source of domestic water supply. Treatment processes employed include lime clarification, recarbonation, mixed media filtration, reverse osmosis (RO), advanced oxidation/disinfection (hydrogen peroxide and ultraviolet UV treatment), and chlorination.

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[1] *The seawater intrusion barrier project is designed to prevent seawater intrusion into the fresh water aquifers underlying the central coastal zone of Orange County, in an area known as the Talbert Gap. Talbert Gap Barrier is located at the Santa Ana Pressure groundwater subbasin.*

The producer installed and operated the hydrogen peroxide addition and ultraviolet irradiation system in September 2001as part of demonstration studies for the GRWS Advanced Water Treatment Facilities (AWTF). The producer also modified its treatment processes to minimize the formation of N-Nitrosodimethylamine (NDMA) and 1,4 dioxane in the recycled water and to remove these constituents effectively. Most recently, to minimize NDMA and 1,4 dioxane production, the WF 21 produced only up to 5 mgd of treated water. With the completion of construction of the interim use microfiltration (MF) facilities, the existing lime clarification facilities were removed from service. The Interim WF 21 is expected to be in operation in mid-2004. The remaining WF 21 facilities will be demolished in 2007.

4. The Interim WF 21 is the WF 21 facilities modified in order to maintain recycled water production to supply the Talbert Gap Barrier during construction of the GWRS. The existing lime clarification, recarbonation, and filtration facilities at WF 21 will be replaced with a microfiltration (MF) system to provide pretreatment for the reverse osmosis (RO) process. In addition, the existing cellulose acetate RO membranes will be changed to new thin film composite polyamide RO membranes. A new ultra-violet light (UV) disinfection unit will be installed for demonstration and certification testing. During this testing, the existing UV system will continue to operate. The new UV system will not be placed in operation as the primary disinfection process until approval has been obtained from CDHS. The treatment process train for the Interim WF 21 will be comprised of MF, RO, and the advanced oxidation process (AOP), which includes hydrogen peroxide addition and UV irradiation. The Interim WF 21 will produce up to 5 mgd of advanced tertiary treated water. The Interim WF 21 facilities will be similar to the GWRS AWTF. Interim WF 21 will discharge recycled water to the Talbert Gap Barrier and will not discharge recycled water to the Kraemer/Miller recharge basins.

5. When construction of GWRS nears completion, the Interim WF 21 will be taken out of service, and portions of its MF, RO, and UV components will be relocated to the GWRS advanced water treatment facilities (AWTF). The Interim WF 21 will be in service for only about three years during construction of the AWTF component of the GWRS, or until late 2006 or early 2007. In Spring 2007, equipment from Interim WF 21 will be relocated to become part of the GWRS AWTF.

6. The GWRS is a joint project by OCWD and OCSD. OCWD is the lead agency for the proposed project. OCSD will provide secondary treated wastewater from its Reclamation Plant No. 1 to the GWRS for advanced treatment. The GWRS will treat the secondary treated wastewater to meet drinking water standards and other limits imposed on recycled water intended for groundwater recharge and indirect potable reuse.

7. The purpose of GWRS is to augment the existing recycled water supply by providing a more reliable and higher quality source of water for recharge, irrigation, and industrial uses and for protection of the Orange County Groundwater Basin from further degradation due to seawater intrusion. The GWRS will also provide peak wastewater flow disposal relief and postpone the need for OCSD to construct a new ocean outfall by diverting treated wastewater flows that would otherwise be discharged to the Pacific Ocean.

8. The GWRS will consist of three major components:

   a. AWTF and pumping stations. The AWTF will replace Interim WF 21 and will be located at the same site as the WF 21 in Fountain Valley. (See Finding 10. below for AWTF processes)

   b. Expansion of the existing Talbert Gap Seawater Intrusion Barrier towards the west along Ellis Avenue in Huntington Beach and towards the southeast along Ward Street and the westerly side of the Santa Ana River to Adams Avenue in Fountain Valley.

   c. A major pipeline connecting the treatment facilities to the existing Kraemer/Miller recharge basins in the Anaheim Forebay area. The GWRS Pipeline will be installed along the westerly levee of the Santa Ana River from the AWTF to the Kraemer/Miller recharge basins.

9. Implementation of the GWRS will be phased. The first phase will produce up to 70 mgd of recycled water. Future phases to expand the capacity of the GWRS are possible. Approximately half of the recycled water produced will be injected at the Talbert Gap Barrier and the remainder will be spread at the Kraemer/Miller recharge basins. The Kraemer Basin in Anaheim will be the primary spreading basin receiving recycled water. The adjacent Miller Basin will be used on a standby basis when Kraemer Basin is periodically taken out of service for cleaning. A minor amount of the GWRS product water may be used occasionally to supplement the Green Acres Project (GAP) [2] for irrigation and industrial uses. During start-up conditions, the GWRS will discharge to the OCSD outfall via a valved piping connection. During peak flow and/or emergency events, the GWRS will discharge up to 100 mgd of tertiary treated and disinfected recycled water to the Santa Ana River[3].

10. Operational testing and start-up of the GWRS AWTF is expected to begin in late 2006. The AWTF will include the following**:**

    a. **Fine Screening:** Secondary treated wastewater from OCSD's Reclamation Plant No. 1 will be strained, or passed through rotating band fine-mesh screens, and chloraminated prior to microfiltration. Screenings will be dewatered and returned to OCSD for disposal.

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[2] *OCWD also owns and operates the Green Acres Project (GAP), which is a conventional tertiary treatment plant and recycled water distribution system. Located at the same site as WF-21, the GAP treatment facilities have supplied about 7.5 mgd of tertiary filtered and disinfected recycled water for landscape irrigation and industrial uses in Fountain Valley, Costa Mesa, Santa Ana, and Huntington Beach since 1990.*

[3] *A separate NPDES Order will be necessary to regulate this discharge.*

b. **Microfiltration:** Screened secondary effluent will flow via gravity to 26 in-basin microfiltration (MF) cells containing submerged racks of hollow fiber membranes with a maximum pore size of 0.2 micron. The nominal rated filtrate production capacity of the MF system will be 86 mgd. The waste backwash will be returned to OCSD for treatment.

c. **Reverse Osmosis:** Stored MF filtrate will be pumped from the MF break tank to the reverse osmosis (RO) system. Upstream of the RO process, the flow will be pretreated by adding sulfuric acid for pH control and threshold inhibitor to prevent precipitation of sparingly soluble salts, and by 10-micron cartridge filtration. Each of the 15 RO trains will have a capacity of 5 mgd. Designed for an 85% recovery rate, the nominal permeate production capacity of the RO system will be 70 mgd. Permeate from the RO system will be discharged to the advanced oxidation /disinfection processes. The waste brine generated from the RO system will be discharged to OCSD's effluent discharge line to the ocean.

d. **Advanced Oxidation/Disinfection:** The advanced oxidation process (AOP) will consist o f two steps: 1). Hydrogen peroxide will be added to the RO permeate upstream of the ultraviolet (UV) light treatment. 2). UV irradiation will be used for disinfection and reduction of light-sensitive contaminants. Hydrogen peroxide exposed to UV irradiation produces hydroxyl radicals that result in advanced oxidation to destroy UV-resistant contaminants. The AOP system is designed to disinfect RO permeate and reduce NDMA levels to a concentration below 10 parts per trillion (ppt). The total nominal capacity of the duty UV system is 70 mgd. The nominal capacity of the standby/peak flow UV system is 30 mgd. In the event that more than 30 mgd of peak/emergency flow needs to be discharged to the river, then recycled water production will be stopped and up to 100 mgd of filtered, UV-disinfected effluent will be discharged to the Santa Ana River. Discharge to the Santa Ana River will be regulated under a separate NPDES permit.

e. **Decarbonation:** Under normal recycled water production, following UV treatment, part of the water will pass through decarbonators to release excess carbon dioxide.

f. **Lime Stabilization:** Lime will be added to the final product water to adjust the pH and reduce the potential for minerals to be leached from the cement lining used in the transmission pipelines.

11. OCWD has operated a 0.43 mgd capacity demonstration project since January 1997 that utilizes the same treatment processes, including microfiltration (MF) and reverse osmosis (RO), as those proposed for the GWRS and Interim WF 21. In addition, OCWD has conducted a pilot advanced oxidation process (AOP) using hydrogen peroxide and UV studies as part of the demonstration project.

The water quality produced by the demonstration project is representative of that anticipated from the GWRS and Interim WF 21. Water quality data from the demonstration project indicate that the GWRS and Interim WF 21 recycled water will meet all requirements of the California Drinking Water Primary and Secondary Maximum Contaminant Levels (MCLs). Data from the demonstration project have also indicated that selected pharmaceutically-active compounds and other toxic contaminants not included in the drinking water standards are removed or reduced to low levels in the product water.

12. In September 2000, OCWD submitted to the California State Department of Health Services (CDHS) a Title 22 Engineering Report for the GWRS. In August 2001, OCWD submitted to the CDHS Addenda Nos. 1, 2, 3, and 4 to the GWRS Engineering Report to provide responses to CDHS' comments on the Engineering Report. In March 2003, OCWD submitted to the CDHS responses to CDHS' comments on the Addenda.

13. The CDHS conducted multiple meetings and discussions with OCWD about the GWRS. On February 4, 2003, CDHS held a public hearing in Fountain Valley, California, to consider the GWRS. A summary of that public hearing is included in this Order as Attachment A. This summary includes "Findings of Fact" and "Conditions". CDHS found that the proposed project complies with Section 60320 of Article 5.1, entitled "Groundwater Recharge" of the California Code of Regulations, Title 22, Division 4, Chapter 3, entitled "Water Recycling Criteria". CDHS found further that the GWRS AWTF processes are considered to be the best available advanced wastewater and recycled water treatment technology at this time. CDHS also found that the proposed operation of the Interim WF 21 and GWRS would not degrade the quality of the water in the receiving aquifers as a source of domestic water supply provided that OCWD meets the "Conditions" stipulated in the "Summary of Public Hearing[4]". CDHS recommended that the Regional Board incorporate all of the "Findings of Fact" and "Conditions" contained in the "Summary of Public Hearing" into the water reclamation requirements for OCWD for the Interim WF 21 and GWRS. This Order implements that recommendation. The "Findings of Fact" are herein incorporated in Attachment A. The Order requires the producer to satisfy the Conditions outlined in Findings of Fact by CDHS, with certain modifications based on discussions with CDHS and the producer. To the extent of any conflict between this Order and the CDHS "Conditions", the requirements of this Order shall govern.

14. Source water for the Interim WF 21 and GWRS will be treated wastewater from OCSD's Reclamation Plant No. 1. Source water undergoes secondary treatment, which includes preliminary, advanced primary, and secondary treatment processes.

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[4] *See Attachment A of this Order, "Summary of Public Hearing".*

15. OCSD implements a comprehensive industrial pretreatment and source control program approved by the Regional Board to control the discharge of toxic wastes from industrial dischargers into OCSD's wastewater collection system. The focus of this program is to prevent adverse effects on the treatment facilities and the environment. The scope and purpose of this OCSD source control program need to be expanded to include not only contaminants that may be detrimental to the facilities or environment, but also to include contaminants specified by CDHS that may be harmful to human health and drinking water supplies. The GWRS source water will not include flows from the Santa Ana River Interceptor Line, which contains inland brines and industrial wastes. OCWD, through a comprehensive monitoring program, will be able to ensure that the recycled water produced at the GWRS AWTF for recharge into the groundwater basin via injection at the Talbert Gap Barrier and spreading at the Kraemer/Miller Basins is not contaminated with toxic chemicals of industrial origin that are of concern to CDHS in drinking water sources. This Order includes provisions requiring OCWD to include in its contractual agreement with OCSD requirements that will allow inclusion into the OCSD source control program those contaminants specified and determined by CDHS as harmful or potentially harmful to human health and drinking water supplies. This Order also prohibits the use of wastewater flows from the Santa Ana River Interceptor Line as source water.

16. The Orange County Groundwater Basin consists of multiple aquifers that extend over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits. Near the ground surface are shallow aquifers: Talbert, Alpha, Beta, Lambda and Upper Rho Aquifers. The majority of the Basin production is from the principal aquifer system: Lower Rho and Main Aquifers. Deeper aquifers exist below the principal aquifer system; however, these zones contain colored water and currently yield limited production. The Newport-Inglewood Fault Zone forms the southwestern boundary between the Basin and ocean of all but the shallowest aquifers in the Basin. The areas where the shallow aquifers are adjacent to the ocean are known as gaps and are susceptible to seawater intrusion. The Basin is impacted by many variables including factors that are some distance from the proposed project. Some of these include drought, pumping patterns and volumes, new and existing extraction projects, and amounts of recharge.

17. The Talbert Gap Barrier Project was implemented by injection of blended advanced treated recycled water from WF 21 with domestic water from City of Fountain Valley, colored water from deep aquifer wells, and domestic water from the Metropolitan Water District of Southern California (MWD) OC44 turnout. . Since WF 21 was taken out of service in January 2004, the Talbert Gap Barrier has received only domestic and colored water from the above sources. The majority of injected water flows inland to replenish the Basin aquifers, which are a source of municipal water supplies. The failure to maintain an effective seawater intrusion barrier would cause serious water quality degradation in drinking water aquifers in Orange County and the potential loss of this water resource.

18. The Talbert Gap Barrier consists of 28 existing injection wells. Of these 28 injection wells, 24 inject into shallow aquifers, three inject into the Main Aquifer, and one injects into both the shallow and Main aquifers.

19. The GWRS will add eight new injection wells that will inject into the shallow and Main Aquifers. Four of these new wells at the western end of Talbert Gap Barrier will inject into the Alpha, Beta, Lambda, and Main Aquifers. The other four new wells at the eastern end of the barrier will inject into the Talbert and Lambda Aquifers.

20. At the Talbert Gap Barrier, OCWD proposes a phased approach to injection of 100 percent recycled water. Initially, a blend of up to a maximum of 75% recycled water and 25% of non-wastewater origin will be injected at the barrier. Recycled water diluents will be potable water for the GWRS and, for the Interim WF 21, a blend of potable and deep aquifer (colored) water. After the GWRS demonstrates compliance with CDHS criteria for recycled water quality and groundwater quality at this initial level for at least one year after the blended recharge water has reached at least one monitoring well, the proposed plan would increase the recycled water contribution up to 100 percent upon CDHS approval. These percentages will be calculated based on the running-monthly-average recycled water contribution for the preceding period up to 60 months.

21. Potable water used for injection into Talbert Gap Barrier will be supplied via a new pipeline (Southeast Barrier Pipeline) connecting the MWD OC44 turnout to the barrier pipeline along Ellis Avenue using a reduced pressure principle backflow prevention device. During the initial 75:25 blend phase for GWRS, the Southeast Barrier Pipeline will deliver potable water to the barrier. The new easterly injection wells, which are located adjacent to the Southeast Barrier Pipeline, will receive potable water and the balance will be distributed to the other injection wells for the blend. When injection of 100% recycled water is approved, the OC44 connection will be severed, and this pipeline will be used to deliver recycled water to the new easterly injection wells.

22. During operation of Interim WF 21, between 3 and 8 mgd of potable water for injection into the Talbert Gap Barrier will be supplied via the MWD OC44 connection as described above, plus between 2 and 5 mgd of potable water via the existing City of Fountain Valley service connection. The Fountain Valley supply is introduced into the existing WF 21 blending reservoir via an air gap. In addition to these diluents, up to 8 mgd of deep aquifer (colored) water will be introduced into the existing WF 21 blending reservoir. From the reservoir, the existing WF 21 pump station will discharge a blend of recycled water, potable water, and deep aquifer water to the Talbert Gap Barrier.

23. When GWRS becomes fully operational, OCWD proposes to recharge via spreading a blend of up to a maximum of 75% recycled water and 25% diluent water at the Kraemer/Miller Basins. Recycled water will be recharged primarily at Kraemer Basin and occasionally at Miller Basin. Diluents will include water of non-wastewater origin, such as captured Santa Ana River storm flows and imported water purchased from MWD that will be recharged at nearby OCWD spreading basins. These percentages will be calculated based on the running-monthly-average recycled water contribution for the preceding period up to 60 months.

24. OCWD has installed 16 groundwater monitoring wells along Ellis Avenue within 2,000 feet of the Talbert Gap Barrier. For the GWRS, OCWD will install, at a minimum, three new multi-depth monitoring wells between the Talbert Gap Barrier injection wells and the nearest domestic water supply wells.

25. To assure that any pathogenic microorganisms that may be present in the recycled water are effectively inactivated or removed, the CDHS has determined that a retention time in the Talbert Gap Barrier area of at least 12 months for the recycled water in the groundwater basin before the water is extracted for drinking purposes, and a minimum horizontal separation of 2,000 feet between the Talbert Gap Barrier injection wells and all drinking water wells, are needed. A retention time in the area of the Kraemer/Miller Basins of at least 6 months and a minimum separation of 500 feet between the Basins and any drinking water wells are needed (See Attachment A of this Order).

26. Groundwater tracer studies were conducted for OCWD by Lawrence Livermore National Laboratory in the area including and downgradient from Kraemer/Miller Basins. These tracer studies demonstrated that water percolated at Kraemer/Miller Basins travels towards the west/southwest away from Anaheim Lake. This confirmed that the closest domestic water production wells, A-27, A-28, A-42, A-43, and A-44, which are located near Anaheim Lake, are upgradient from Kraemer/Miller Basins and therefore, would not be impacted by the GWRS. Wells A-27, A-28, A-42, A-43, and A-44 are owned and operated by the City of Anaheim and are replenished from different upgradient basins.

27. Based on the groundwater tracer studies conducted by Lawrence Livermore National Laboratory, recycled water recharged at Kraemer/Miller Basins will flow towards the west/southwest, towards existing active domestic production wells SCWC-PLJ2 and A-26, owned and operated by Southern California Water Company (SCWC) and the City of Anaheim, respectively. Domestic water well SCWC-PLJ2 is located approximately 5,300 feet from Kraemer Basin. Domestic water well A-26 is located approximately 7,800 feet from Kraemer Basin, the closer of the two recharge basins. The estimated retention times for recharge water from Kraemer Basin are 6 months to well SCWC-PLJ2 and 8 months to well A-26. Because the arrival time to well SCWC-PLJ2 is roughly equivalent to the six-month minimum travel time requirement, well SCWC-PLJ2 will be taken out of production and replaced outside of the buffer zone prior to the time that the recycled water spread at Kraemer/Miller Basin reaches well SCWC-PLJ2. As a result, well A-26 will be the closest active domestic water supply well to the proposed Kraemer/Miller Basin recharge operation.

28. OCWD has installed four groundwater monitoring wells and will install, at minimum, one new multi-depth monitoring well at west of Kraemer/Miller Basins along the groundwater flow path towards domestic water supply well A-26. After well SCWC-PLJ2 is taken out of service, it will be used for monitoring purposes, as it is located about three-quarters of the distance between Kraemer/Miller Basins and well A-26.

29. It is important that new drinking water wells are constructed outside the area required to achieve 12 months of retention time and a minimum of 2,000 horizontal feet separation from the injection operation at Talbert Gap Barrier for inactivation of microorganisms. OCWD will adopt a resolution that effectively prevents the use of groundwater for drinking water purposes within this CDHS buffer zone to avoid the construction of new domestic water wells within this area of injection wells. The resolution will be invoked and in place prior to the start of injection of recycled water from the GWRS. In addition, OCWD will request that the Orange County Well Standards Advisory Board establish criteria to prevent construction of drinking water wells in the buffer area. This Board advises permitting agencies, Orange County Health Care Agency and the City of Fountain Valley, on well permitting criteria and will recommend that any new drinking water wells be located at least 2,000 feet from the nearest injection well and that the recycled water have a retention time of at least 12 months underground prior to withdrawal near the Talbert Gap Barrier.

30. It is important that new drinking water wells are constructed outside the area required to achieve 6 months of retention time and a minimum of 500 horizontal feet separation downgradient from the spreading operation at Kraemer/Miller Basins for inactivation of microorganisms. OCWD will adopt a resolution that effectively prevents the use of groundwater for drinking water purposes within this CDHS buffer zone to avoid the construction of new domestic water wells within this area of spreading basins. The resolution will be invoked and in place prior to the start of recharge of recycled water from the GWRS. In addition, OCWD will request that the Orange County Well Standards Advisory Board establish criteria to prevent construction of drinking water wells in the buffer area. This Board advises the permitting agencies, Orange County Health Care Agency and the City of Anaheim, on well permitting criteria and will recommend that any new drinking water wells be located at least 500 feet from the spreading basins and that the recycled water have a retention time of at least 6 months underground prior to withdrawal near Kraemer/Miller Basins.

31. The CDHS recommends that to ensure that the Interim WF-21 and GWRS AWTF meet the performance criteria and produce recycled water that meets all requirements specified in the Order, an operating plan needs to be developed for the first year and should be updated periodically to take into account the experiences learned from the prior years of operation. Proper operation needs to be defined and cover critical parameters in each treatment process. This Order requires OCWD to develop/implement/ update and submit this operating plan one month before the start of operation of the interim WF 21. The plan is to be reviewed annually and updated as necessary. The Interim WF 21 operating plan will be used as the basis for the GWRS operation and maintenance plan, which is to include an operation and maintenance manual that is to be updated as necessary.

32. A Water Quality Control Plan (Basin Plan) became effective on January 24, 1995. The Basin Plan contains beneficial uses and water quality objectives for waters in the Santa Ana Region. The Basin Plan specifies water quality objectives and beneficial uses for groundwater within the Santa Ana Pressure and Santa Ana Forebay groundwater Subbasins.

33. The injection wells overlie the Santa Ana Pressure groundwater subbasin, while the spreading area overlies the Santa Ana Forebay groundwater subbasin. The beneficial uses of these subbasins include:

    a. municipal and domestic supply;
    b. agricultural supply;
    c. industrial services supply; and
    d. industrial process supply.

34. The limitations contained in this Order are intended to protect these uses and maintain water quality in these Subbasins. Since domestic supply is a beneficial use, limitations are based on CDHS' primary and secondary drinking water standards (MCLs) in the Drinking Water Quality and Monitoring Requirements, California Code of Regulations (CCR), Title 22, Chapter 15, and Basin Plan objectives. The proposed limits on total nitrogen, total organic carbon, total coliform, turbidity, lead and copper, and other regulated and unregulated constituents are based on CDHS' recommendations in the February 4, 2003 "Summary of Public Hearing" document for GWRS. These limitations are necessary to assure the protection of public health and the use of the groundwater basin for domestic supply.

35. Section 13540 of the California Water Code provides that recycled water may be injected by a well into a water-bearing stratum, provided that (1) the Regional Board finds that water quality considerations do not preclude controlled recharge of the stratum by direct injection, and (2) the CDHS, following a public hearing, finds that the proposed recharge will not degrade the quality of water in the receiving aquifer as a source of water supply for domestic purposes. As described above, CDHS conducted the requisite hearing on February 4, 2003 and concluded that the recharge will not degrade receiving water quality, provided that the Conditions specified in the Summary of Public Hearing (Attachment A to this Order) are met.

36. Section 13523 of the California Water Code provides that a Regional Board, after consulting with and receiving recommendations from the CDHS or its delegated local health agency, and after any necessary hearing, shall, if it determines such action to be necessary to protect the health, safety, or welfare of the public, prescribe water recycling requirements for water that is used or proposed to be used as recycled water. In order to assure the protection of public health and the use of the groundwater as a source of domestic water supply, it is appropriate for the Regional Board to prescribe water recycling requirements for Interim WF 21 and the GWRS. Section 13523 further provides that water recycling requirements shall include, or be in conformance with, the statewide uniform recycling criteria established by the CDHS pursuant to the California Water Code Section 13521. The Regional Board has consulted with the CDHS regarding the recycling project and its use in groundwater recharge, and has incorporated their recommendations in this Order.

37. Provided that the GWRS project is conducted in conformance with this Order, water quality considerations do not preclude controlled recharge of the groundwater by direct injection (i.e., injection at the Talbert Gap Barrier).

38. As required by Section 60323 of Title 22, California Code of Regulations, OCWD submitted an Engineering Report on its production and use of recycled water for GWRS dated September 2000, and Addenda Nos. 1 through 4 to the Engineering Report on the GWRS dated August 2001. This Order requires OCWD to review and update the Engineering Report every five years and submit the updated report to the CDHS and the Regional Board.

39. Pursuant to Section 402(p) of Clean Water Act and Title 40 of the Code of Federal Regulations (CFR) Part 122, 123, and 124, the State Water Resources Control Board (State Board) adopted general NPDES permits to regulate storm water discharges associated with industrial activity (State Board Order No. 97-03-DWQ adopted on April 17, 1997) and construction activity (State Board Order No. 99-08-DWQ adopted on August 19, 1999). Storm water discharges from the Interim WF 21 and proposed GWRS are subject to requirements under these general permits. OCWD has submitted Notices of Intent to be covered under these general permits and has developed and implemented Storm Water Pollution Prevention Plan to comply with the general NPDES permits.

40. In compliance with the California Environmental Quality Act (Public Resources Code Section 21000 et seq.), OCWD prepared and certified an Environmental Impact Report (EIR) for the Interim WF 21 and GWRS. The EIR identified no significant adverse impact to water quality as a result of the use of recycled water.

41. The Regional Board has notified OCWD and interested agencies and persons of its intent to issue Water Recycling Requirements for this discharge, and has provided them with an opportunity to submit their written views and recommendations.

42. The Regional Board, in a public meeting, heard and considered all comments pertaining to these water-recycling requirements.

IT IS HEREBY ORDERED that the discharger, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder shall comply with the following:

A. RECYCLED WATER QUALITY SPECIFICATIONS

1. The recycled water[5] used for injection and/or recharge shall not contain constituent concentrations in excess of the limits specified in Tables I, II, III and IV below:

[5] *Recycled water is 100 % effluent from Interim WF 21 or GWRS without any blending.*

TABLE I	
Chemical	Maximum Concentration Limit, (Units in mg/L unless noted otherwise)
Inorganic Chemicals	
Aluminum	1.
Antimony	0.006
Arsenic	0.05
Asbestos	7 MFL[6]
Barium	1.
Beryllium	0.004
Cadmium	0.005
Chromium	0.05
Cyanide	0.15
Fluoride	2.
Mercury	0.002
Nickel	0.1
Selenium	0.05
Thallium	0.002
Volatile Organic Chemicals (VOCs)	
Benzene	0.001
Carbon Tetrachloride	0.0005
1,2-Dichlorobenzene	0.6
1,4-Dichlorobenzene	0.005
1,1-Dichloroethane	0.005
1,2-Dichloroethane	0.0005
1,1-Dichloroethylene	0.006
cis-1,2-Dichloroethylene	0.006
trans-1,2-Dichloroethylene	0.01
Dichloromethane	0.005
1,2-Dichloropropane	0.005
1,3-Dichloropropene	0.0005
Ethylbenzene	0.3
Monochlorobenzene	0.07
Styrene	0.1
1,1,2,2-Tetrachloroethane	0.001
Tetrachloroethylene	0.005
Toluene	0.15
1,2,4-Trichlorobenzene	0.005
1,1,1Trichloroethane	0.200
1,1,2-Trichloroethane	0.005
Trichloroethylene	0.005

[6] *MFL = million fibers per liter; MCL for fibers exceeding 10 um in length.*

TABLE I	
Chemical	Maximum Concentration Limit, (Units in mg/L unless noted otherwise)
Trichlorofluoromethane	0.15
1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2
Vinyl Chloride	0.0005
Xylenes	1.750[7]
Non-Volatile Synthetic Organic Chemicals (SOCs)	
Alachlor	0.002
Atrazine	0.001
Bentazon	0.018
Benzo(a)pyrene	0.0002
Carbofuran	0.018
Chlordane	0.0001
2,4-D	0.07
Dalapon	0.2
Dibromochloropropane (DBCP)	0.0002
Di(2-ethylhexyl)adipate	0.4
Di(2-ethylhexyl)phthalate	0.004
Dinoseb	0.007
Diquat	0.02
Endothall	0.1
Endrin	0.002
Ethylene Dibromide (EDB)	0.00005
Glyphosate	0.7
Heptachlor	0.00001
Heptachlor Epoxide	0.00001
Hexachlorobenzene	0.001
Hexachlorocyclopentadiene	0.05
Lindane	0.0002
Methoxychlor	0.03
Molinate	0.02
Oxamyl	0.05
Pentachlorophenol	0.001
Picloram	0.5
Polychlorinated Biphenyls	0.0005
Simazine	0.004
Thiobencarb	0.07
Toxaphene	0.003
2,3,7,8-TCDD (Dioxin)	3×10^{-8}
2,4,5-TP (Silvex)	0.05
Disinfection Byproducts	

[7] *Limit is for either a single isomer or the sum of the isomers.*

TABLE I	
Chemical	Maximum Concentration Limit, (Units in mg/L unless noted otherwise)
Total Trihalomethanes (TTHM)	0.080
Total Haloacetic acids (five) (HAA5)	0.060
Bromate	0.010
Chlorite	1.0
Chemical	
Copper	1.3
Lead	0.015

TABLE II	
Radio nuclides	**Maximum Concentration Limit, pCi/l**
Combined Radium-226 and Radium-228	5
Gross Alpha particle activity (including Radium-226 but excluding Radon and Uranium)	15
Tritium	20,000
Strontium-90	8
Gross Beta particle activity	50
Uranium	20

Table III	
	Maximum Concentration Limits
Aluminum	0.2 mg/L
Color	15 Units
Copper	1.0 mg/L
Corrosivity	Non-corrosive
Foaming Agents (MBAS)	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Methyl-*tert*-butyl ether (MTBE)	0.005 mg/L
Odor—Threshold	3 Units
Silver	0.1 mg/L
Thiobencarb	0.001 mg/L
Turbidity	5 Units
Zinc	5.0 mg/L

TABLE IV			
Constituent	***Unit***	***12-month Average Concentration Limit***	
		Talbert Gap Barrier	Kraemer/Miller Basins
Total Dissolved Solids	*mg/l*	500	600
Nitrate nitrogen	"	3	3
Hardness	"	240	290
Sodium	"	45	60
Chloride	"	55	65
Sulfate	"	100	120

2. The total volume of recycled water generated from Interim WF 21 for injection into the Talbert Gap Barrier shall not exceed 5 mgd based on a monthly average flow.

3. The total volume of recycled water generated from GWRS for injection and/or recharge at surface spreading basins shall not exceed 70 mgd based on a monthly average flow (up to 78,400 acre-feet per year (afy)).

4. Recycled water used for groundwater injection and recharge shall, at all times, be adequately oxidized, filtered, subject to organics removal by RO and AOP using UV and hydrogen peroxide addition, and disinfected. There shall be no bypassing of any treatment process, except for decarbonation and lime stabilization. Only a part of the product water will pass through decarbonators. Lime treatment will be provided only if and as needed for pH adjustment.

5. The turbidity of the RO product water prior to disinfection shall not exceed any of the following:

   a. 0.2 Nephelometric turbidity units (NTU) more than 5 percent of the time in any 24-hour period; and
   b. 0.5 NTU at any time.

6. UV disinfection[8] shall comply with the "Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse" (June 2003) published by the National Water Research Institute (NWRI) which specify for RO permeate that:

   a. The design UV dose shall be at least 50 millijoules per square centimeter (mJ/cm^2) under maximum day flow;
   b. The effluent turbidity shall be equal to or less than 0.2 NTU 95 percent of the time, and not to exceed 0.5 NTU at any time; and
   c. The RO permeate UV transmittance shall be 90 percent or greater at 254 nanometers (nm).

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[8] *UV irradiation following membrane filtration has been recognized by the DHS as an acceptable alternative disinfection method to chlorination to achieve at least a 5-log inactivation of virus.*

7. The total nitrogen concentration of the recycled water shall not exceed 5 mg/l as nitrogen[9].

8. The Total Organic Carbon (TOC) concentration of the recycled water shall not exceed 0.5 mg/l divided by the CDHS-specified maximum average recycled water contribution (RWC[10]).

9. Disinfected recycled water for injection and/or spreading shall meet the following criteria.

   a. The 7-day median number of total coliform shall not exceed 2.2 total coliform bacteria Most Probable Number (MPN) per 100 milliliters (ml).
   b. The number of total coliform organism shall not exceed 23 total coliform bacteria (MPN) per 100 ml in more than one sample in any 30-day period prior to injection or spreading.
   c. No sample shall exceed 240 total coliform bacteria (MPN) per 100 ml.

10. The pH of recycled water shall at all times be within the range of 6 to 9 pH units.

11. Recycled water shall not contain oil and grease in concentrations greater than 1 mg/l.

B. COMPLIANCE DETERMINATION:

1. Compliance with maximum concentration limits specified in Tables I and II of Recycled Water Quality Specifications A.1 shall be based on the running-quarterly average, calculated each quarter using the previous four quarters of data.

2. Compliance with maximum concentration limits specified in Table III of Recycled Water Quality Specifications A.1. shall be based on the annual average.

3. Compliance with the 12-month average concentration limits specified in Table IV of Recycled Water Quality Specifications A.1. shall be based on a 12-month running average.

4. Compliance with total nitrogen concentration specified in Recycled Water Quality Specifications A.7., above, shall be based on the running average of all samples collected during the past 20 weeks.

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[9] *Total Nitrogen is defined as the sum of ammonia, nitrite, nitrate, and organic nitrogen concentration, expressed as nitrogen.*

[10] *Recycled water contribution (RWC) means the fraction of the total recharge water that is of recycled water origin.*

5. Compliance with TOC concentration specified in Recycled Water Quality Specifications A.8., above, shall be based on the running average of the most recent 20 samples. Determination of compliance shall begin as soon as four samples have been collected, averaging all available samples up to 20 samples. After that time, compliance shall be determined monthly based on the most recent 20 TOC samples. The average of the most recent 20 samples shall be determined monthly.

C. DILUENT WATER QUALITY SPECIFICATIONS

1. Diluents for Interim WF 21 at the Talbert Gap Barrier shall be potable water and/or deep aquifer (colored) water. Diluent for the GWRS at the Talbert Gap Barrier shall be potable water. Diluent for the GWRS at the Kraemer/Miller Basins shall be captured Santa Ana River storm flows and/or imported water. Compliance shall be determined on a monthly running average basis over a time period up to a maximum of the preceding 60 months.

2. During the initial operating period, the monthly running average RWC that is injected into the Talbert Gap Barrier or recharged in the vicinity of Kraemer/Miller Basins in the Anaheim Forebay shall not exceed 75% of the total water recharged via injection or spreading at each location.

D. REQUIREMENTS FOR 100 PERCENT RECYCLED WATER CONTRIBUTION

Following the successful compliance of the initial operating period, the producer may increase the monthly running average RWC to 100 percent if the following are documented in a report submitted to and approved by the CDHS:

1. Operations, monitoring, and compliance data;
2. Injection and/or surface-spreading recharge water has reached at least one GWRS monitoring well for at least one year with an average RWC of at least 0.6, and the GWRS has been in compliance with the existing CDHS-specified maximum average RWC of 0.75;
3. Recycled water quality produced at the AWTF has consistently met all requirements;
4. Appropriate construction and siting of the monitoring well(s) used in the demonstration have been validated;
5. An updated engineering report;
6. Review and assessment of the increased RWC by a scientific peer advisory panel; and
7. Water quality data collected at the monitoring well(s) used in the demonstration:

    a. Meets all effluent limitations specified in Section A. - Recycled Water Quality Specifications, A.1.- Tables I, II, III and IV;
    b. Meets the total nitrogen criteria specified in Section A. - Recycled Water Quality Specifications, A. 7; and

c. Indicated that the non-regulated contaminants, including TOC in Section A.8., total coliform levels in Section A.9., and any endocrine disrupting chemicals, pharmaceuticals, or other water quality constituents specified by CDHS based on the results of the recycled water monitoring are not increasing to unacceptable levels in the groundwater basin due to the recharge operation.

E. GROUNDWATER MONITORING WELL REQUIREMENTS

1. Groundwater monitoring to detect the influence of the GWRS water recharged via injection and spreading shall be performed. Monitoring wells shall be sited at locations within approximately three months underground travel time of each recharge area and at additional intermediate points between each recharge area and nearest downgradient domestic water supply well, and such that samples can be obtained independently from each aquifer potentially conveying the recharge water. Monitoring well locations shall be determined based on a numerical model, tracer, or other method to determine the estimated underground travel time from the recharge operation to the monitoring well sites. If a tracer is used, the tracer shall be determined prior to start-up.

2. At a minimum, three new multi-depth groundwater monitoring wells, M-45, M-46 and M-47, shall be constructed for the GWRS in Fountain Valley between the Talbert Gap Barrier injection wells and nearby domestic water supply wells. For the nearest domestic water supply well, MCWD-5, well M-46 shall be installed near the Santa Ana River approximately three to four months travel time from the barrier (approximately 700 feet), and well M-47 shall be installed approximately one-half of the distance (approximately 1,500 feet) between the barrier and MCWD-5. A third new monitoring well, M-45, shall be constructed approximately one-half of the distance (about 2,800 feet) between the barrier and the Newport Beach production wells, NB-TAMS, NB-TAMD, NB-DOLS, and NB-DOLD.

3. At a minimum, one new multi-depth groundwater monitoring well, AMD-12, shall be constructed for the GWRS west of Kraemer/Miller Basins along the groundwater flow path toward domestic water supply well A-26 to monitor water quality in multiple zones of the Main Aquifer. Well AMD-12 shall be located approximately 2,600 feet away from the recharge operation, or about one-third of the distance (approximately three months travel time) between Kraemer/Miller Basins and well A-26. In addition, two existing monitoring wells, AM-7 and AM-8[11], located west of Kraemer/Miller Basins along the flow path toward well A-26, shall be regularly monitored. After it is taken out of service, well SCWC-PLJ2[12], may be used for monitoring purposes.

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[11] *AMD-7 is located at about one-quarter of the distance (approximately 2 months travel time) between Kraemer/Miller Basins and well A-26. AM-8 is located at approximately one-half of the distance (approximately four months travel time) between Kraemer/Miller Basins and well A-26.*

[12] *Well SCWC-PLJ2 is located about three-quarters of the distance (approximately six months travel time) between Kraemer/Miller Basins and well A-26,*

F. BUFFER ZONE SPECIFICATIONS IN RECHARGED GROUNDWATER BASINS

1. At the Talbert Gap Barrier, the recycled water shall be retained in the groundwater basin for a minimum of 12 months prior to being withdrawn at a domestic water supply wells. A numerical model, tracer, or other method shall be used to determine the underground retention time and recycled water concentration to each aquifer. Any recycled water that may already be present in the groundwater because of on-going project related activities should be accounted for as a part of the total amount of recycled water in calculating the percent of recycled water in an aquifer. If a tracer is used, the tracer shall be determined prior to start-up.

2. At the Talbert Gap Barrier, no domestic drinking water wells shall be allowed within a buffer zone defined by the area less than 2,000 feet and 12 months underground travel time from the Talbert Gap Barrier.

3. At the Kraemer/Miller Basins, the recycled water shall be retained in the groundwater basin for a minimum of 6 months prior to being withdrawn at a domestic water supply well. A numerical model, tracer, or other method shall be used to determine the underground retention time and recycled water contribution to each aquifer. If a tracer is used, the tracer shall be determined prior to start-up.

4. At the Kraemer/Miller Basins, no domestic drinking water wells shall be allowed within a buffer zone defined by the area less than 500 feet and 6 months underground travel time from Kraemer/Miller Basins.

G. OPERATION, MAINTENANCE AND MONITORING/REPORTING REQUIREMENTS

1. OMMP:

   a. An operations, maintenance and monitoring plan (OMMP) shall be developed and submitted to CDHS and the Regional Board for approval at least one month prior to startup of the Interim WF 21. The producer shall operate its Interim WF 21 facilities in accordance with the approved OMMP. Annually thereafter, the OMMP shall be reviewed, updated as necessary and submitted to the CDHS and Regional Board for review and approval. The updated Interim WF 21 OMMP shall be used as the basis for the GWRS OMMP. This GWRS OMMP shall include the operation and maintenance manual specified in Provision 14. Section J, below.

b. All OMMPs shall cover critical operational parameters and shall include routine testing procedures for all treatment processes (MF, RO, and AOP systems, optimization of the hydrogen peroxide dose, UV dose for disinfection), maintenance and calibration schedules for monitoring equipments, process alarm set points, and response procedures for alarms in each treatment process of the AWTF, including criteria for diverting recycled water if water quality requirements are not met, start-up, peak flow and emergency discharges to the Santa Ana River[13], and emergency response and contingency plans. During the first year of operation, of Interim WF 21 and the GWRS, all treatment processes shall be optimized to reduce contaminant levels. The results of these initial optimization efforts shall be incorporated into the updated OMMPs. OMMPs shall include staffing levels with applicable certifications levels for AWTF operations personnel. Significant changes in the operation of any of the treatment processes shall be reported to the CDHS and Regional Board. Significant changes in the approved OMMPs must be approved by the CDHS and Regional Board prior to instituting changes.

2. Total Nitrogen:

a. If the 20-week average total nitrogen concentration of recycled water exceeds 5 mg/l as nitrogen, recharge of recycled water shall be suspended until the total nitrogen concentration does not exceed 5 mg/l as nitrogen. Within seven days of the suspension, a report describing the cause of the failure and the corrective actions taken to avoid future violations of these requirements shall be submitted to the CDHS and the Regional Board.

b. If the average total nitrogen concentration in all samples of the recycled water collected for analysis exceed 5 mg/l as nitrogen for more than two consecutive weeks, then a report describing the cause of the exceedance and the corrective actions taken to avoid future violations of these requirements shall be submitted to the CDHS and the Regional Board within 30 days.

c. If a single sample of recycled water for total nitrogen analysis exceeds 5 mg/l as nitrogen, a confirmation sample shall be collected within 48 hours and analyzed within 72 hours. If the average of the initial and confirmation samples exceeds 5 mg/l as nitrogen, an enhanced groundwater monitoring program shall be conducted at the closest downgradient monitoring well located one to three months underground travel time from the recharge operation. Weekly sampling and analysis for total nitrogen at the closest monitoring well shall begin four weeks prior to and continue until four weeks after the anticipated arrival time of the recycled water having the elevated total nitrogen level.

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[13] *Discharges to the Santa River will be regulated by a separate NPDES permit.*

d. At the closest monitoring well, if the nitrite concentration exceeds 1 mg/l as nitrogen, or if the sum of the ammonia, nitrite, and organic nitrogen concentrations exceeds 3 mg/l as nitrogen, then the program shall be expanded to the next-closest downgradient monitoring well located three to four months underground travel time from the recharge operation. Weekly sampling and analysis for total nitrogen at the next-closest monitoring well shall continue until four weeks after the anticipated arrival time of the recycled water having the elevated total nitrogen level.

e. During the enhanced groundwater monitoring program at either the closest or next-closest monitoring well, if the sum of the ammonia, nitrite, and organic nitrogen concentrations does not exceed 3 mg/l as nitrogen, then normal groundwater monitoring as required in Section Groundwater Monitoring Program for Monitoring Wells in Recharged Areas, Monitoring and Reporting Program No. R8-2004-0002 may resume.

f. During the enhanced groundwater monitoring program at the next-closest monitoring well, if the nitrite concentration exceeds 1 mg/l as nitrogen, or if the sum of the ammonia, nitrite, and organic nitrogen concentrations exceeds 3 mg/l as nitrogen, then weekly sampling and analysis for total nitrogen at the closest domestic well shall begin four weeks prior to and continue until four weeks after the anticipated arrival of the recycled water having the elevated total nitrogen level.

g. Within 30 days of conclusion of enhanced groundwater monitoring, a report summarizing the results of the enhanced groundwater monitoring program and describing the cause of the exceedance and corrective actions taken to avoid future violations of these requirements shall be submitted to the CDHS and Regional Board.

3. <u>TOC:</u>

a. If the running average TOC concentration in the most recent 20 samples of recycled water exceeds 0.5 mg/l divided by the CDHS-specified maximum average RWC, then recharge via injection and spreading of recycled water shall be suspended until the above TOC requirement can be met. Within seven days of the suspension, the producer shall notify the CDHS and Regional Board.

b. If the average of the last four recycled water samples exceeds the TOC concentration of 0.5 mg/l divided by the CDHS-specified maximum average RWC, a report shall be submitted to CDHS and Regional Board within 60 days that described the reasons and the corrective actions that have been taken to avoid future occurrences.

4. Turbidity: A failure to meet the turbidity performance requirements listed in Section A - Recycled Water Quality Specifications in this Order shall result in the suspension of using recycled water as injection water until such time that the cause of the failure has been identified and corrected. Any failure to meet the turbidity performance requirements shall be reported to CDHS and the Regional Board in the next monthly report.

5. Coliform: A failure to meet the 7-day median coliform requirement for two consecutive days shall result in the suspension of using recycled water as injection water until such time the cause of the failure has been identified and corrected. Any failure to meet the total coliform requirements specified in Section A. - Recycled Water Quality Specifications in this Order shall be reported to CDHS and Regional Board in the next monthly report, describing the cause of the failure and the corrective actions taken to avoid future violations of these requirements.

6. General Operation/Monitoring /Reporting:

   a. If any recycled water analytical results for any designated contaminant identified in Section A. – Recycled Water Quality Specifications Tables I-IV with the exception of nitrogen (see also Section G.2.c.) exceeds the constituent concentrations specified in Section A. – Recycled Water Quality Specifications for that constituent, the laboratory shall notify the producer within 72 hours of completing the analysis, and a follow-up confirmation sample shall be collected and analyzed for that constituent within 21 days of the notification. If the average of the initial and confirmation samples also exceeds the specified constituent concentration for the identified pollutant, the cause of the exceedance shall be investigated and appropriate corrections shall be made, and a report shall be submitted to the CDHS and Regional Board.

   b. If the average of the initial and confirmation samples exceeds the concentration listed in Section A – Recycled Water Quality Specifications for two consecutive quarters, recharge of recycled water shall be suspended, the cause of the exceedance shall be investigated and appropriate corrections shall be made, and a report shall be submitted to the CDHS and Regional Board.

H. GENERAL REQUIREMENTS FOR INJECTION AND SPREADING OF RECYCLED WATER

1. The discharge or use of raw or inadequately treated wastewater at any time is prohibited.

2. No brine wastes shall be used for groundwater recharge or injection.

3. Odors of sewage origin shall not be perceivable beyond the limits of Interim WF 21 or GWRS.

4. Standby emergency power facilities and sufficient diversion capacity shall be provided for diversion of recycled water in the event of upsets or outages at the GWRS.

5. Adequate facilities shall be provided to protect the GWRS and the seawater barrier system from damage by storm flows and runoff.

6. The injection of recycled water shall not result in earth movement in geologically unstable areas.

7. The injection and spreading of recycled water shall not impart tastes, odors, color, foaming, or other objectionable characteristics to receiving groundwater.

8. Recycled water injected and spread into groundwater basins shall not contain any substances in concentrations toxic to human, animal, plant, or aquatic life.

9. Injection and spreading of recycled water shall not cause a violation of any applicable water quality standards for receiving groundwater adopted by CDHS or Regional Board.

10. Prior to the onset of operation, the producer shall have in place a resolution adopted by its governing board that it will be responsible for developing a plan for providing an alternative source of domestic water supply, or a CDHS approved treatment mechanism, to any user whose domestic water well is found to violate California Drinking Water Quality Regulations as a direct result of the GWRS or when CDHS makes an analysis and finding that the domestic water well is unsuitable for human consumption as a direct result of the GWRS. Such alternative sources can include water delivered for blending of the producing well, imported water, water produced at a wellhead treatment plant, and water produced from new wells.

I. REQUIRED NOTICES AND REPORTS

1. Reporting Provisions:

   a. All reports, or information submitted to the Regional Board shall be signed by a responsible officer or duly authorized representative of the producer and shall be submitted under penalty of perjury.

   b. The producer shall furnish, within a reasonable time, any information the Regional Board may request to determine compliance with this Order or whether cause exists for modifying, revoking and reissuing, or terminating this Order. The producer shall also furnish to the Regional Board, upon request, copies of records required to be kept by this Order.

   c. All reports prepared in accordance with the terms of this Order shall be available for public inspection at the offices of the Regional Board. Knowingly making any false statements on any such report may result in the imposition of criminal penalties as provided for in Section 13387 of the California Water Code.

2. The producer shall provide adequate notice to the Regional Board of any change in the volume or character of pollutants being introduced by an existing or new source into the treatment facility that will cause or threaten to cause a violation of this Order.

3. The producer shall file with the Regional Board a Report of Waste Discharge at least 120 days before making any material change in the character, location, or volume of the discharge. A material change includes, but is not limited to, the following:

   a. Significantly changing the method of treatment.
   b. Increasing the discharge flow beyond that specified in this Order.

4. The producer shall report any condition related to the producer's treatment facility or distribution system that may endanger human health or the environment. All available information concerning the condition shall be provided to the Executive Officer or the Executive Officer's designee (909-782-4130) and the Office of Emergency Services (800-852-7550), as soon as the producer becomes aware of the circumstances. A written report shall be submitted within 5 days and shall contain a description of the condition and its cause; the duration of the condition, including exact dates and times, and, if the condition has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence of the condition, with a schedule for their implementation. The Executive Officer or the Executive Officer's designee may waive the above-required written report on a case by case basis.

J. PROVISIONS

1. Neither the treatment nor the discharge of wastes shall cause a nuisance or pollution as defined in Section 13050 of the California Water Code.

2. The producer shall comply with Monitoring and Reporting Program No. R8-2004-0002 as issued by the Executive Officer. Revision of this monitoring and reporting program by the Executive Officer may be necessary to confirm that the producer is in compliance with the requirements and provisions contained in this order. Revisions may be made at any time during the term of this Order, and may include a reduction or an increase in the number of parameters to be monitored, the frequency of monitoring or the number and size of samples collected.

3. Order No. 91-12, as amended by Orders No. 93-28 and 93-74, is hereby rescinded.

4. The discharge of recycled water to surface waters is prohibited unless authorized by an NPDES permit.

5. The producer shall maintain a copy of this Order at the site so that it is available to site operating personnel at all times. Key operating personnel shall be familiar with its content.

6. The producer shall promptly report to the Regional Board any proposed change in the character, location or method of disposal of the discharge, or any proposed change in ownership of the facility.

7. Major modifications to the treatment systems as described in the Engineering Report and associated Addenda, technical memoranda and correspondence shall be subject to review by the CDHS and the Regional Board.

8. The producer shall adopt a resolution that effectively prevents the use of groundwater for drinking water purposes within the area required to achieve 12 months underground retention time and 2,000 feet of horizontal separation from the Talbert Gap Barrier and within the area to achieve 6 months retention time and 500 feet of horizontal separation from the Kraemer/Miller Basins. The resolution shall be invoked prior to the start of injection or spreading of recycled water from the GWRS.

9. The producer shall notify the Orange County Well Standards Advisory Board of its resolution to prevent construction of any domestic supply wells within the buffer zones specified in Section F., above.

10. The producer shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this order, including such accelerated or additional monitoring as may be necessary to determine the nature and impact of the noncompliance.

11. The producer shall insure that all facilities and systems of treatment, distribution, and control (and related appurtenances) which are installed or used to achieve compliance with conditions of this order are at all times properly operated and maintained. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures. This provision requires the operation of backup and auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this order.

12. The treatment plant and wastewater storage facilities shall be protected from a 100-year frequency flood.

13. The producer shall allow the Executive Officer, or any authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

    a. Enter upon premises where a regulated facility or activity is located or conducted, including recycled water treatment or discharge facilities, reject stream and screening disposal activities, or facilities where records must be kept under the requirements of this Order.

b. Have access to and copy any records that must be kept under the conditions of this permit. Inspect, photograph, and sample or monitor, at reasonable times, any facilities equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, including recycled water treatment, discharge, reject streams or screenings disposal sites.

c. To sample or monitor influent and effluent for the purposes of determining compliance with this permit.

14. The producer shall update as necessary, the "Operation and Maintenance Manual (O&M Manual)" which it has developed for the treatment facility to conform with latest plant changes and requirements. The O&M Manual shall be readily available to operating personnel onsite. The O&M Manual shall include the following:

a. Description of the treatment plant table of organization showing the number of employees, duties and qualifications and plant attendance schedules (daily, weekends and holidays, part-time, etc.). The description should include documentation that the personnel are knowledgeable and qualified to operate the treatment facility so as to achieve the required level of treatment at all times.

b. Detailed description of safe and effective operation and maintenance of treatment processes, process control instrumentation and equipment.

c. Description of laboratory and quality assurance procedures.

d. Process and equipment inspection and maintenance schedules.

e. Description of safeguards to assure that, should there be reduction, loss, or failure of electric power, the producer will be able to comply with requirements of this Order.

f. Description of preventive (fail-safe) and contingency (response and cleanup) plans for controlling accidental discharges, and for minimizing the effect of such events. These plans shall identify the possible sources (such as loading and storage areas, power outage, waste treatment unit failure, process equipment failure, tank and piping failure) of accidental discharges, untreated or partially treated waste bypass, and polluted drainage.

15. The producer's wastewater treatment plant shall be supervised and operated by persons possessing certificates of appropriate grade pursuant to Title 23, Division 3, Chapter 14 California Code of Regulations.

16. The discharge of any radiological, chemical, or biological warfare agent or high level radiological waste is prohibited.

17. The producer shall file with the Board by April 1, 2005, a technical report on its preventive (failsafe) and contingency (cleanup) plans for controlling accidental discharges and for minimizing the effect of such events. The technical report shall:

    a. Identify the possible sources of accidental loss, untreated waste bypass, and contaminated drainage. Loading and storage areas, power outage, waste treatment outage, and failure of process equipment, tanks, and pipes should be considered.

    b. Evaluate the effectiveness of present facilities and procedures and state when they become operational. Describe facilities and procedures needed for effective preventive and contingency plans.

    c. Predict the effectiveness of the proposed facilities and procedures and provide an implementation schedule containing interim and final dates when they will be constructed, implemented, or operational.

18. An independent advisory panel shall provide on-going periodic scientific peer review of the GWRS. At a minimum, members of the advisory panel shall include a toxicologist, an engineering geologist or hydrogeologist registered in California, an engineer registered in California and experienced in the fields of wastewater treatment and public water supply, a microbiologist, and a chemist. During the initial five years of the operation of Interim WF-21 and/or GWRS, the panel shall meet at least annually to review the prior year's annual report of plant operations, OMMP, recycled water and groundwater quality monitoring reports, and associated groundwater recharge issues. After five years of operation, the frequency of the panel meetings may be reduced to once every two years upon the approval of the CDHS and the Regional Board's Executive Officer. Based on its review, the panel shall make recommendations for changes in the plant operations, OMMP, and water quality monitoring, including methods for analysis and frequency of sampling for endocrine disrupting chemicals and pharmaceuticals, tentatively identified chemicals (TIC), and other emerging contaminants, including selected action levels as recommended by CDHS, and other recommendations as appropriate. The panel shall submit a report at least once every two years summarizing its recommendations to OCWD. OCWD shall forward the panel's report to the Regional Board and CDHS. OCWD shall implement those recommendations directed by the Regional Board's Executive Officer, based on consultation with CDHS.

19. The producer shall assure through its contractual agreement with OCSD that the wastewater collection system of OCSD is operated under a comprehensive industrial pretreatment and pollutant source control program for the control of discharge of toxic wastes from point sources. The contractual agreement shall include provisions that will allow inclusion in the pretreatment and source control program requirements for OCSD Reclamation Plant No. 1 any contaminants that CDHS has identified may pose a risk of contamination to a drinking water supply.

20. Only secondary treated wastewater from the OCSD Reclamation Plant No. 1 that does not include wastewater flows from the Santa Ana River Interceptor line shall be used as influent source water for advanced tertiary treatment at the Interim WF 21 and GWRS.

I, Gerard J. Thibeault, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an order adopted by the California Regional Water Quality Control Board, Santa Ana Region, on March 12, 2004.

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Gerard J. Thibeault
Executive Officer

SUMMARY OF PUBLIC HEARING

In the Matter of:

Orange County Water District)
Groundwater Replenishment System)

On February 4, 2003, the California Department of Health Services (DHS) and California Department of Water Resources (DWR) held a joint public hearing in Fountain Valley, California, to consider the proposed Groundwater Replenishment System (GWR System), which is a seawater intrusion barrier and water supply project jointly sponsored by the Orange County Water District (OCWD) and Orange County Sanitation District (OCSD).

A list of public hearing attendees is included in Attachment A.

The hearing panel included:

Hearing Officer

Cindy Forbes, P.E., Chief of the Southern California Branch, Drinking Water Field Operations, State of California Department of Health Services

OCWD and OCSD staff made a presentation on the proposed project. Describing the background of and need for the project, they noted that planning for the GWR System began in the mid-1990's and discussed the project's local and regional benefits. The GWR System will produce recycled water to recharge the Orange County Groundwater Basin via injection and surface spreading. They described details of the project components, which include the advanced water treatment facilities, seawater intrusion barrier, and transmission pipeline to the spreading basins. The OCSD source control program was reviewed along with plans to expand the program to include drinking water compounds of concern. Water quality data based on OCWD's full-scale demonstration project were presented. Both OCWD and OCSD pledged their commitment to source control and extensive monitoring to assure the highest water quality for this new water supply.

The presentation was followed by statements from 15 members of the audience. While the majority of the commenters favored the project, some voiced concerns about water quality, source control, unknown or future compounds of concern, and coordination between regulatory agencies.

FINDINGS OF FACT

1. Section 13540 of the California Water Code requires that recycled water may only be injected into an aquifer that is used as a source of domestic water supply if the DHS finds that the recharge will not degrade the quality of water in the receiving aquifer as a source of water supply for domestic purposes.

2. OCWD is a public agency formed by a Special Act of the California Legislature in 1933 for the purpose of managing the supply and protecting the quality of the Orange County Groundwater Basin (the Basin). OCWD has operated Water Factory 21 (WF-21) and the Talbert Gap Seawater Intrusion Barrier (Talbert Gap Barrier) since 1975. WF-21 is an advanced water treatment plant that produces highly treated wastewater that meets the DHS requirements for injection into the Talbert Gap Barrier to prevent the inflow of seawater into the groundwater basin, which is used as a source of domestic water supply. WF-21 is located at 10500 Ellis Avenue, Fountain Valley, California, 92708. Talbert Gap Barrier consists of pipelines and injection wells, primarily located along Ellis Avenue in Fountain Valley and Huntington Beach, California. OCWD operates WF-21 and Talbert Gap Barrier under California Regional Water Quality Control Board, Santa Ana Region (SARWQCB) Order No. 91-121, as amended by Order Nos. 93-28 and 93-74. In Anaheim and Orange, California, OCWD manages and operates approximately 1,100 acres of groundwater recharge facilities in and adjacent to the Santa Ana River and Santiago Creek. OCWD also owns and operates the Green Acres Project (GAP), which is a conventional tertiary treatment plant and recycled water distribution system. Located at the same site as WF-21, the GAP treatment facilities have supplied about 7 mgd of tertiary filtered and disinfected recycled water for landscape irrigation and industrial uses in Fountain Valley, Costa Mesa, Santa Ana, and Huntington Beach since 1990.

3. OCSD is a public agency formed in 1946 under the County Sanitation Act of 1923 as a single purpose entity, providing wastewater collection, treatment, and disposal for north and central Orange County. Since 1954, OCSD has operated Reclamation Plant No. 1, a wastewater treatment facility. Reclamation Plant No. 1 provides wastewater that has been treated to secondary effluent standards to OCWD's WF-21 and GAP as source water. Reclamation Plant No. 1 is located at 10844 Ellis Avenue, Fountain Valley, California, 92708, adjacent to WF-21. OCSD operates a collection system, two wastewater treatment plants, two discharge outfalls to the ocean, and two emergency weir outlets to the Santa Ana River under a National Pollutant Discharge Elimination System (NPDES) permit issued by the U.S. Environmental Protection Agency, NPDES Permit No. CA0110604, and SARWQCB Order No. 98-5, as amended in July 2002 by SARWQCB Order No. R8-2002-0055.

4. OCWD and OCSD plan to construct and operate the Groundwater Replenishment System (GWR System). OCWD is the lead agency for the proposed project. The GWR System will replace and augment the existing recycled water supply by providing a more reliable and higher quality source of water to protect the Basin from further degradation due to seawater intrusion and to provide additional water for recharge, irrigation, and industrial uses. The GWR System will treat wastewater to meet drinking water standards and other limits imposed on recycled water intended for groundwater recharge and indirect potable reuse. The GWR System will also provide peak wastewater flow disposal relief and postpone the need for OCSD to construct a new ocean outfall by diverting treated wastewater flows that would otherwise be discharged to the Pacific Ocean.

   The GWR System will consist of three major components: (1) advanced water treatment facilities (AWTF) and pumping stations; (2) expansion of an existing seawater intrusion barrier; and (3) a major pipeline connecting the treatment facilities to existing recharge basins. The AWTF will replace WF-21 and be located at the same site at the southeast corner of the intersection of Ellis Avenue and Ward Street in Fountain Valley, California. The Talbert Gap Barrier will be expanded towards the west along Ellis Avenue in Huntington Beach and towards the southeast along Ward Street and the westerly side of the Santa Ana River to Adams Avenue in Fountain Valley. The GWR Pipeline will be installed along the westerly levee of the Santa Ana River from the AWTF in Fountain Valley to existing spreading basins in the Anaheim Forebay area, traversing the Cities of Fountain Valley, Santa Ana, Orange and Anaheim. Kraemer Basin in Anaheim will be the primary spreading basin receiving recycled water. The adjacent Miller Basin will be used on a standby basis when Kraemer Basin is periodically taken out of service for cleaning.

   Implementation of the GWR System will be phased. Phase 1 will produce up to 78,400 acre-feet per year (afy) (or 70 million gallons per day (mgd)) of recycled water. Future phases are possible to expand the capacity of the GWR System. Approximately half of the recycled water will be injected at the Talbert Gap Barrier and the remainder will be spread at the Kraemer/Miller Recharge Basins. A minor amount of the GWR System product water may occasionally be used or supplement the GAP for irrigation and industrial uses.

   The treatment technology used for the proposed project will consist of:

   - Source Control: OCSD maintains a comprehensive industrial pretreatment and source control program approved by the SARWQCB for control of waste discharges from point sources into the wastewater collection system.
   - Secondary Treatment: Wastewater will be treated at OCSD's Reclamation Plant No. 1, which features preliminary, advanced primary, and secondary

treatment processes. The existing rated capacity of Plant No. 1 is 108 mgd. Preliminary treatment consists of barscreens and grit removal. Primary treatment consists of coagulant addition and sedimentation. Following primary clarification, the primary effluent flow stream is split and oxidized using two secondary treatment processes, activated sludge and trickling filters. The existing capacity of the activated sludge system is 80 mgd. The balance of the flow is treated using trickling filters. Secondary clarifiers at the activated sludge system and trickling filters produce fully oxidized and clarified secondary effluent. Secondary effluent will be the source water supplied to the GWR System AWTF.

- Fine Screening: Secondary treated wastewater from OCSD's Reclamation Plant No. 1 will be strained, or passed through rotating band fine-mesh screens, and chloraminated prior to microfiltration. Screenings will be dewatered and returned to OCSD for disposal.

- Microfiltration: Screened secondary effluent will flow via gravity to 26 in-basin microfiltration (MF) cells containing submerged racks of hollow fiber membranes with a maximum pore size of 0.2 micron. This MF system has been accepted by DHS as an approved alternative to media filtration. By means of a vacuum, filtrate pumps will draw water through the MF membranes via a piping manifold and discharge the filtrate to the MF break tank. The nominal rated filtrate production capacity of the MF system will be 86 mgd. The MF cells will be periodically backwashed to clean the membranes. The waste backwash will be returned to OCSD for treatment.

- Reverse osmosis: Stored MF filtrate will be pumped from the MF break tank to the reverse osmosis (RO) system. Upstream of the RO process, the flow will be pretreated by adding sulfuric acid for pH control and threshold inhibitor to prevent precipitation of sparingly soluble salts, and by 10-micron cartridge filtration. Each of the 15 RO trains will have a capacity of 5 mgd and will consist of a high pressure feed pump and 150 pressure vessels arranged in three stages in a 78:48:24 array. The RO system will use thin film composite polyamide membranes. Designed for an 85 percent recovery rate, the nominal permeate production capacity of the RO system will be 70 mgd. Permeate from the RO system will be discharged to the advanced oxidation and ultraviolet light treatment/disinfection processes. Concentrated brine from the RO system will be returned to OCSD for disposal.

- Advanced oxidation / disinfection: The advanced oxidation process (AOP) will consist of two steps: hydrogen peroxide will be added to the RO permeate upstream of the ultraviolet (UV) light treatment. UV irradiation will be used for disinfection and reduction of light-sensitive contaminants. Hydrogen peroxide exposed to UV irradiation produces hydroxyl radicals

that result in advanced oxidation to destroy UV-resistant contaminants, such as N-nitrosodimethylamine (NDMA). The UV system will conform to the requirements delineated in the "Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse" (December 2000) published by the National Water Research Institute (NWRI). The AOP system is designed to disinfect RO permeate and reduce NDMA levels to a concentration below 10 parts per trillion (ppt). The hydrogen peroxide dosage will be optimized during development of the operations, maintenance and monitoring plan. The closed, in-vessel type UV system will feature low-pressure high-output lamps with the reactors arranged in eight duty trains, plus one standby/peak flow train. The total nominal capacity of the duty trains is 70 mgd. The nominal capacity of the standby/peak flow train is 30 mgd. The duty and standby UV trains are separated by valves to allow the system to produce recycled water at the same time as peak or emergency flows are discharged to the Santa Ana River. In the event that more than 30 mgd of peak/emergency flow needs to be discharged to the river, then recycled water production will be stopped, the separation valves will be opened, and all UV trains will discharge up to 100 mgd filtered, disinfected effluent to the Santa Ana River.

- Decarbonation: Under normal recycled water production, following UV treatment, part of the water will pass through decarbonators to release excess carbon dioxide. Approximately 40 to 60 mgd of the flow will pass through five decarbonation towers, and 10 to 30 mgd will bypass this process to produce the targeted level of carbon dioxide.
- Lime stabilization: Lime will be added to the final product water to adjust the pH and reduce the potential for minerals to be leached from the cement lining used in the transmission pipelines.

The proposed project complies with Section 60320 of Article 5.1, entitled "Groundwater Recharge", of the California Code of Regulations Title 22, Division 4, Chapter 3, entitled "Water Recycling Criteria". DHS considers the above treatment processes to be the best available advanced wastewater and recycled water treatment technology at this time.

5. During construction of GWR System, WF-21 will remain in operation in an interim mode to supply Talbert Gap Barrier. Improvements will be made to modify the existing WF-21 treatment processes. The modified facilities will be known as Interim WF-21 and will be similar to the GWR System AWTF. The existing WF-21 produces up to 5 mgd of recycled water using lime clarification, recarbonation, mixed media filtration, RO, and advanced oxidation/disinfection (hydrogen peroxide and UV treatment). Portions of the existing WF-21 facilities will be replaced or modified in order to maintain recycled water production during construction of the GWR System. The existing lime clarification, recarbonation,

and filtration processes will be replaced with an initial MF system to provide pretreatment for the RO process. In addition, the existing cellulose acetate RO membranes will be changed to new thin film composite polyamide RO membranes. A new UV unit will be installed for demonstration and certification testing. During this testing period, the existing UV system will continue to operate. The new UV system will not be placed in operation until approval has been obtained from DHS. The capacity of the modified or Interim WF-21 will be 5 mgd. Later, when construction of GWR System nears completion, Interim WF-21 will be taken out of service, and portions of its MF, RO, and UV components will be relocated to the GWR System AWTF.

6. In 2000 and 2002 respectively, NDMA and 1,4-dioxane from the existing WF-21 operation were found in domestic wells in the vicinity of the Talbert Gap Barrier at concentrations above the DHS Action Levels. To reduce the concentrations of these compounds, additional source control measures were taken by OCSD, and AOP treatment, consisting of hydrogen peroxide addition and UV irradiation, was added to the existing WF-21 treatment train.

7. An effective source control program is currently provided by OCSD to minimize the risk that wastewater treated at Reclamation Plant No. 1 will be contaminated with toxic chemicals to protect the treatment facilities and the marine environment. The scope and purpose of this OCSD source control program need to be expanded to include not only contaminants that may be detrimental to the facilities or environment, but also to include contaminants specified by DHS that may be harmful to human health and drinking water supplies. The GWR System source water will not include flows from the Santa Ana River Interceptor, which contains inland brines and industrial wastes. OCWD, through a comprehensive monitoring program, will be able to ensure that the recycled water produced at the GWR System AWTF for recharge into the groundwater basin via injection at the Talbert Gap Barrier and spreading at Anaheim Forebay is not contaminated with toxic chemicals of industrial origin that are of concern to DHS in drinking water sources.

8. To ensure that the GWR System AWTF and Interim WF-21 meet the performance criteria and produce recycled water that meets all requirements specified in the SARWQCB permit, an operating plan needs to be developed for the first year and should be updated periodically to take into account the experiences learned from the prior years of operation. Proper operation needs to be defined and cover critical parameters in each treatment process.

9. To ensure that any pathogenic microorganisms that may be present in the recycled water are effectively inactivated or removed, a retention time in the Talbert Gap Barrier area of at least 12 months for the recycled water in the groundwater basin before the water is extracted for drinking purposes and a

minimum horizontal separation of 2,000 feet between the Talbert Gap Barrier injection wells and all drinking water wells is needed. A retention time in the Anaheim Forebay area of at least 6 months for the recycled water in the groundwater basin before the water is extracted for drinking purposes and a minimum of 500 feet between the Kraemer/Miller Recharge Basins and all drinking water wells is needed.

10. OCWD has operated Talbert Gap Barrier since 1975 by injecting recycled water produced by WF-21 to prevent seawater intrusion into the Orange County Groundwater Basin. Domestic water from City of Fountain Valley and colored water from deep aquifer wells have also been injected into the Talbert Gap Barrier. The amount of recycled water injected has historically ranged between about 900 and 8,000 acre-feet per year. The majority of injected water flows inland to replenish the Basin aquifers, which are a source of municipal water supplies. The failure to maintain an effective seawater intrusion barrier would cause serious water quality degradation in drinking water aquifers in Orange County and the potential loss of this water resource.

11. The Orange County Groundwater Basin consists of multiple aquifers that extend over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits. Near the ground surface are shallow aquifers: Talbert, Alpha, Beta, Lambda and Upper Rho Aquifers. The majority of the Basin production is from the principal aquifer system: Lower Rho and Main Aquifers. Deeper aquifers exist below the principal aquifer system; however, these zones contain colored water and currently yield limited production. The Newport-Inglewood Fault Zone forms the southwestern boundary between the Basin and ocean of all but the shallowest aquifers in the Basin. The areas where the shallow aquifers are adjacent to the ocean are known as gaps and are susceptible to seawater intrusion. The Basin is impacted by many variables including factors that are some distance from the proposed project. Some of these include drought, pumping patterns and volumes, new and existing extraction projects, and amounts of recharge.

12. The Talbert Gap Barrier consists of 26 existing injection wells, plus two new injection wells currently under construction. Of these 28 injection wells, 24 wells inject into shallow aquifers, 3 wells inject into the Main Aquifer, and 1 well injects into both the shallow and Main aquifers.

13. The GWR System will add 8 new injection wells that will inject into the shallow and Main aquifers. Four of these new wells at the west end of Talbert Gap Barrier will inject into the Alpha, Beta, Lambda, and Main Aquifers. The other four new wells at the east end of the barrier will inject into the Talbert and Lambda Aquifers.

14. At the Talbert Gap Barrier, OCWD proposes a phased approach to injection of 100 percent recycled water. Initially, a blend of up to a maximum of 75 percent recycled water and 25 percent water of non-wastewater origin will be injected at the barrier. Diluents will be potable water for GWR System and a blend of potable and deep aquifer (colored) water for Interim WF-21. After the GWR System demonstrates compliance with DHS criteria for recycled water quality and groundwater quality at this initial level for at least one year after the blended recharge water has reached at least one monitoring well, the proposed plan would increase the recycled water contribution up to 100 percent, upon DHS approval. These percentages will be calculated based on the running-monthly-average recycled water contribution for the preceding period up to 60 months.

15. Potable water for injection into Talbert Gap Barrier will be supplied via a new pipeline (Southeast Barrier Pipeline) connecting the Metropolitan Water District of Southern California (MWD) OC44 turnout to the barrier pipeline along Ellis Avenue using a reduced pressure principle backflow prevention device. During the initial 75:25 blend phase for GWR System, the Southeast Barrier Pipeline will deliver potable water to the barrier. The new easterly injection wells, which are located adjacent to the Southeast Barrier Pipeline, will receive potable water and the balance will be distributed to the other injection wells for the blend. When injection of 100 percent recycled water is approved, the OC44 connection will be severed, and this pipeline will be used to deliver recycled water to the new easterly injection wells.

16. During operation of Interim WF-21, between 3 and 8 mgd of potable water for injection into Talbert Barrier will be supplied via the MWD OC44 connection as described above, plus between 2 and 5 mgd of potable water via the existing City of Fountain Valley service connection. The Fountain Valley supply is introduced into the existing WF-21 blending reservoir via an air gap. In addition to these diluents, up to 8 mgd of deep aquifer (colored) water will be introduced into the existing WF-21 blending reservoir. From the reservoir, the existing WF-21 pump station will discharge a blend of recycled water, potable water, and deep aquifer water to Talbert Gap Barrier.

17. Interim WF-21 will discharge recycled water to the Talbert Gap Barrier. Interim WF-21 will not discharge recycled water to the Anaheim Forebay spreading basins.

18. When GWR System becomes operational, OCWD proposes to recharge via spreading a blend of up to a maximum of 75 percent recycled water and 25 percent diluent water at the Anaheim Forebay. Recycled water will be recharged primarily at Kraemer Basin and occasionally at Miller Basin. Diluents will include water of non-wastewater origin, such as captured Santa Ana River storm flows and imported water purchased from MWD that will be recharged at

nearby OCWD spreading basins. These percentages will be calculated based on the running-monthly-average recycled water contribution for the preceding period up to 60 months.

19. The closest active domestic well to the Talbert Gap Barrier is Mesa Consolidated Water District's Well No. MCWD-5. Well MCWD-5 is located approximately 3,100 feet from the Talbert Gap Barrier. The retention time prior to extracting water of recycled water origin at this well is estimated at 24 months.

20. The closest active domestic well to Kraemer Basin is the City of Anaheim's Well No. A-43. Well No. A-43 is located approximately 1,800 feet from Kraemer Basin and 1,300 feet from Miller Basin. The closest active domestic well to Miller Basin is the City of Anaheim's Well No. A-44. Well No. A-44 is located approximately 2,000 feet from Kraemer Basin and 900 feet from Miller Basin.

21. Groundwater tracer studies were conducted for OCWD by Lawrence Livermore National Laboratory in the area including and downgradient from Kraemer/Miller Basins. These tracer studies demonstrated that water percolated at Kraemer/Miller Basins travels towards the west/southwest away from Anaheim Lake. This confirmed that the closest domestic water production wells, A-27, A-28, A-42, A-43, and A-44, which are located near Anaheim Lake, are upgradient from Kraemer/Miller Basins and therefore, would not be impacted by the GWR System. Wells A-27, A-28, A-42, A-43, and A-44 are owned and operated by the City of Anaheim and are replenished from different, upgradient basins.

22. Based on the groundwater tracer studies conducted by Lawrence Livermore National Laboratory, recycled water recharged at Kraemer/Miller Basins will flow towards the west/southwest, towards existing active domestic production wells SCWC-PLJ2 and A-26, owned and operated by Southern California Water Company (SCWC) and the City of Anaheim, respectively. Domestic water well SCWC-PLJ2 is located approximately 5,300 feet from Kraemer Basin. Domestic water well A-26 is located approximately 7,800 feet from Kraemer Basin, the closer of the two recharge basins. The estimated retention times for recharge water from Kraemer Basin are 6 months to well SCWC-PLJ2 and 8 months to well A-26. Because the arrival time to well SCWC-PLJ2 is roughly equivalent to the six-month minimum travel time requirement, well SCWC-PLJ2 will be taken out of production and replaced outside of the buffer zone prior to the time that the recycled water spread at Kraemer/Miller Basin reaches well SCWC-PLJ2. As a result, well A-26 will be the closest active domestic water supply well to the proposed Kraemer/Miller Basin recharge operation.

23. It is important that new drinking water wells are constructed outside the area required to achieve 12 months of retention time and a minimum of 2,000 horizontal feet separation from the injection operation at Talbert Gap Barrier for

inactivation of microorganisms. OCWD will adopt a resolution that effectively prevents the use of groundwater for drinking water purposes within this DHS buffer zone to avoid the construction of new domestic water wells within this area of injection wells. The resolution will be invoked and in place prior to the start of injection of recycled water from the GWR System. In addition, OCWD will request that the Orange County Well Standards Advisory Board establish criteria to prevent construction of drinking water wells in the buffer area. This Board advises permitting agencies, Orange County Health Care Agency and the City of Fountain Valley, on well permitting criteria and will recommend that any new drinking water wells be located at least 2,000 feet from the nearest injection well and that the recycled water have a retention time of at least 12 months underground prior to withdrawal near the Talbert Gap Barrier.

24. It is important that new drinking water wells are constructed outside the area required to achieve 6 months of retention time and a minimum of 500 horizontal feet separation downgradient from the spreading operation at Kraemer/Miller Basins for inactivation of microorganisms. OCWD will adopt a resolution that effectively prevents the use of groundwater for drinking water purposes within this DHS buffer zone to avoid the construction of new domestic water wells within this area of spreading basins. The resolution will be invoked and in place prior to the start of recharge of recycled water from the GWR System. In addition, OCWD will request that the Orange County Well Standards Advisory Board establish criteria to prevent construction of drinking water wells in the buffer area. This Board advises the permitting agencies, Orange County Health Care Agency and the City of Anaheim, on well permitting criteria and will recommend that any new drinking water wells be located at least 500 feet from the spreading basins and that the recycled water have a retention time of at least 6 months underground prior to withdrawal near Kraemer/Miller Basins.

25. Three new multi-depth monitoring wells, M-45 through M-47, will be constructed in Fountain Valley between the Talbert Gap Barrier injection wells and the nearest domestic water supply wells. Wells M-46 and M-47 will be installed near the Santa Ana River approximately three to four months travel time and one-half the distance (about 700 and 1,500 feet from the barrier), respectively, to the nearest domestic water supply well, MCWD-5. Wells M-46 and M-47 will sample the Lambda/Omicron, Upper Rho, Lower Rho, and Main Aquifers. Because several groundwater flow paths exist between the barrier injection wells and inland domestic water supply wells, well M-45 will be installed approximately one-half the distance (about 2,800 feet from the barrier) between the barrier and the Newport Beach production wells (NB-TAMS, NB-TAMD, NB-DOLS, and NB-DOLD), which lie about a mile north of the barrier. Well M-45 will sample the Alpha, Beta, Lambda/Omicron and Main Aquifers. Existing multi-zone monitoring wells, M-10 and M-11, are located in this flow path between the Newport Beach wells and the barrier, approximately three months travel time

from the barrier. Besides these three new monitoring wells, 16 other monitoring wells exist within 2,000 feet of the Talbert Gap Barrier.

26. One new multi-depth monitoring well, AMD-12, will be constructed west of Kraemer/Miller Basins along the groundwater flow path toward domestic water supply well A-26. AMD-12 will monitor water quality in multiple zones of the Main Aquifer. AMD-12 will be installed in Anaheim, approximately 2,600 feet west of Kraemer/Miller Basins, which is about one-third the distance (about three months travel time) between Kraemer/Miller Basins and well A-26. In addition to this new monitoring well, four existing monitoring wells, AM-7, AM-8, AMD-10, and OCWD-KB1 are located west of Kraemer/Miller Basins along the flow path towards well A-26. Well AM-7 is located at about one-quarter the distance (about two months travel time) between Kraemer/Miller Basins and well A-26 and will monitor water quality in the shallow zone of the Main Aquifer. Well AM-8 is located at approximately one-half the distance (about four months travel time) between Kraemer/Miller Basins and well A-26 and will monitor water quality in the shallow zone of the Main Aquifer. Wells AMD-10 and OCWD-KB1 are located immediately west of Kraemer/Miller Basin. Tracer studies have indicated the travel time to the shallowest zone at AMD-10 is about one month and to well OCWD-KB-1 is less than one month. After well SCWC-PLJ2 is taken out of service, it will be used for monitoring purposes, as it is located about three-quarters of the distance (about six months travel time) between Kraemer/Miller Basins and well A-26.

27. Operations, maintenance, and monitoring plans (OMM Plans) for Interim WF-21 and GWR System will be submitted for review and approval by the DHS and SARWQCB. The OMM Plans will describe operating, maintenance, and monitoring procedures for normal, start-up, peak flow, upset, off-spec, and emergency conditions. The OMM Plans will address source control concerns, water quality issues, and include a contingency plan and an emergency response plan.

28. OCWD has operated a 0.43 mgd capacity demonstration project since January 1997 that utilizes the same treatment processes, MF and RO, as those proposed for the GWR System and Interim WF-21. In addition, OCWD has conducted pilot AOP (hydrogen peroxide and UV) studies at the demonstration project. The water quality produced by the demonstration project is representative of that anticipated from the GWR System and Interim WF-21. Water quality data from the demonstration project indicate that GWR System and Interim WF-21 water will meet all requirements of the California Drinking Water Primary and Secondary Maximum Contaminant Levels (MCLs). Data from the demonstration project also have indicated that selected pharmaceutically active compounds and other toxic contaminants not included in

the drinking water standards are removed or reduced to low levels in the product water.

29. During short-term peak storm flow events, start-up, and emergency conditions, GWR System will treat and discharge up to 100 mgd under two operating scenarios: (1) continued production of recycled water with excess flows discharged to the Santa Ana River (SAR); and (2) all flow discharged to the SAR. Under the first scenario, the AWTF will continue to produce up to 70 mgd of recycled water for recharge via injection and spreading using the full MF, RO, and AOP treatment train. Excess flows (up to 30 mgd) will be chloraminated, treated using MF and a separate UV train (bypassing RO), and then dechlorinated and discharged via a dedicated pipeline to the SAR near the AWTF site. Under the second scenario, no recycled water will be produced and the entire flow stream (up to 100 mgd) will be chloraminated, treated using MF and UV (bypassing RO), and then dechlorinated and discharged via a dedicated pipeline to the SAR near the AWTF site. All discharges to the SAR will comply with the SARWQCB Basin Plan. The expected duration of a peak flow event is 8 to 12 hours. It is anticipated that peak storm flow events may occur less than once per year (0.6 times per year) based on flow projections for 2020.

30. An independent advisory panel has reviewed the planning and design of the GWR System. On-going periodic meetings of this panel, which is named the Technical Review Committee, are planned to review design criteria, reliability, water quality, and operational issues. Members of the Technical Review Committee include distinguished members of the academic community (George Tchobanoglous, water and wastewater treatment and water recycling specialist and registered engineer from University of California, Davis; Karl Linden, UV disinfection specialist from Duke University; and Edward Wei, toxicologist from University of California, Berkeley); a hydrogeologist (Dennis Williams, Geoscience); a water reuse and wastewater treatment specialist (Margie Nellor, County Sanitation Districts of Los Angeles County); a water resources expert (Ron Linsky, National Water Research Institute); and regulators participating on an ex-officio basis (Rick Sakaji, State Department of Health Services; and Hope Smythe, Regional Water Quality Control Board, Santa Ana Region). The Technical Review Committee will provide scientific peer review to guide the project during final design, construction, and startup.

CONDITIONS

Based on the above FINDINGS OF FACT, which are made pursuant to the information provided by Orange County Water District (OCWD) and Orange County Sanitation District (OCSD) in the Engineering Report on the Groundwater Replenishment System (GWR System) dated September 2000, Addenda Nos. 1 through 4 to the Engineering Report on the GWR System dated August 2001, subsequent submittals in the form of letters and technical memoranda, and the presentations by OCWD and OCSD and comments made by members of the public at the Public Hearing held by the California Department of Health Services, Drinking Water Field Operations Branch, on February 4, 2003, in Fountain Valley, California, the California Department of Health Services (DHS) FINDS that the proposed operation of the GWR System and Interim Water Factory 21 (Interim WF-21) will not degrade the quality of the water in the receiving aquifers as a source of domestic water supply PROVIDED THAT ALL OF THE FOLLOWING CONDITIONS ARE MET:

1. The total volume of recycled water recharged by injection and surface spreading shall not exceed 70 million gallons per day (mgd) based on a monthly average (up to 78,400 acre-feet per year (afy)).

2. Treatment of recycled water intended for groundwater recharge shall consist of advanced primary sedimentation and secondary treatment, followed by microfiltration (MF), reverse osmosis (RO), advanced oxidation process (AOP), including hydrogen peroxide addition and ultraviolet (UV) light treatment and disinfection, with decarbonation and/or lime stabilization as needed for pH adjustment. Major modifications to the treatment train as described in the Engineering Report and associated Addenda, technical memoranda and correspondence shall be subject to review by the DHS and the Santa Ana Regional Water Quality Control Board (SARWQCB).

3. Recycled water for recharge via injection and spreading shall, at all times, be adequately oxidized, filtered, subject to organics removal by RO and AOP using UV and hydrogen peroxide addition, and disinfected. There shall be no bypassing of any treatment process, except for decarbonation and lime treatment, which provide pH adjustment as required for stabilization in Condition 2. During peak storm flow events, start-up or emergency conditions, effluent that is not recycled shall be adequately oxidized, filtered, and disinfected for discharge to the Santa Ana River.

4. The wastewater collection system of the OCSD shall be operated under a comprehensive industrial pretreatment and pollutant source control program for

the control of discharge of toxic wastes from point sources, which is approved by the SARWQCB. If DHS identifies any contaminants that may pose a risk of contamination to a drinking water supply, it may designate those contaminants for inclusion in the pretreatment and source control program requirements for OCSD Reclamation Plant No. 1 to minimize the possibility that the influent wastewater to Reclamation Plant No. 1 and the secondary treated wastewater that is source water to the GWR System and Interim WF-21 will be contaminated with such toxic chemicals. The GWR System source water shall not include flows from the Santa Ana River Interceptor. Quarterly composite and/or grab samples shall be taken of the OCSD Reclamation Plant No. 1 secondary effluent and the GWR System and Interim WF-21 recycled water prior to recharge via injection and spreading and analyzed for contaminants designated by DHS. If any recycled water analytical result for any designated contaminant exceeds the designated concentration, the laboratory shall notify OCWD within 72 hours of completing the analysis, and a follow-up confirmation sample shall be collected and analyzed within 21 days of the notification. If the average of the initial and confirmation samples also exceeds the designated concentration for the identified pollutant, the causes of the exceedance shall be investigated and appropriate corrections shall be made, and a report shall be submitted to the DHS and SARWQCB. If the average of the initial and confirmation samples exceeds the above concentration for two consecutive quarters, recharge of recycled water shall be suspended, the causes of the exceedance shall be investigated and appropriate corrections shall be made, and a report shall be submitted to the DHS and SARWQCB. If recharge of recycled water is suspended, effluent may be discharged to the Santa Ana River as permitted by the SARWQCB.

5. During the initial operating period, the monthly running average recycled water contribution (RWC) that is injected into the Talbert Gap Barrier or recharged in the vicinity of Kraemer/Miller Basins in the Anaheim Forebay shall not exceed 75 percent of the total water recharged via injection or spreading at each location. Diluents for Interim WF-21 at the Talbert Gap Barrier shall be potable water and/or deep aquifer (colored) water. Diluent for the GWR System at the Talbert Gap Barrier shall be potable water. Diluents for the GWR System at the Anaheim Forebay shall be captured Santa Ana River storm flows and/or imported water. Compliance shall be on a monthly running average basis over a time period up to a maximum of the preceding 60 months. Once a month, the average RWC shall be calculated during this period by dividing the total volume of recycled water injected or spread during the preceding months by the total volume of injection or spread water during that period. If the average RWC does not comply with the above requirement, OCWD shall notify the DHS and SARWQCB within 7 days and submit a report to the DHS and the SARWQCB

within 60 days describing the reason and corrective actions taken to avoid future occurrences.

6. Following the successful completion of the initial operating period, OCWD may increase the monthly running average RWC to 100 percent if the following are documented in a report submitted to and approved by the DHS:

   - Operations, monitoring, and compliance data;
   - Injection and/or surface-spread recharge water has reached at least one GWR System monitoring well for at least one year with an average RWC of at least 0.6 (60 percent recycled water), and the GWR System has been in compliance with the existing DHS-specified maximum average RWC of 0.75 (75 percent recycled water);
   - Recycled water quality produced at the AWTF has consistently met all requirements;
   - Appropriate construction and siting of the monitoring well(s) used in the demonstration have been validated;
   - An updated engineering report;
   - Review and assessment of the increased RWC by a scientific peer advisory panel; and
   - Water quality data collected at the monitoring well(s) used in the demonstration:
     - Meets all primary drinking water standards specified below in Condition No. 8;
     - Meets the total nitrogen criteria specified below in Condition No. 9; and
     - Indicates that the non-regulated contaminants, including TOC and those specified in Tables 64449-A and 64449-B, total coliform levels, and any endocrine disrupting chemicals, pharmaceuticals, or other water quality constituents specified by DHS based on the results of the recycled water monitoring are not increasing over the levels in the recycled water due to the recharge operation.

7. Any recycled water that may already be present in the groundwater because of on-going project related activities should be accounted for as a part of the total amount of recycled water in calculating the percent of recycled water in an aquifer.

8. The recycled water injected and recharged shall, at all times, meet all primary maximum contaminant levels specified in the Drinking Water Quality and

Monitoring Requirements, California Code of Regulations (CCR), Title 22, Chapter 15 as follows:

- Inorganic chemicals in Table 64431-A (except for nitrogen compounds);
- Radionuclides in Table 4, Section 64443;
- Organic chemicals in Table 64444-A;
- Any new Federal or State maximum contaminant level upon adoption;
- Disinfection byproducts in Section 64533, Chapter 15.5;
- Action levels for lead and copper in Section 64678; and
- Secondary maximum contaminant levels in Tables 64449-A and 64449-B ("Upper" levels).

Recycled water shall be monitored on a quarterly basis at regular intervals by analyzing a 24-hour composite or grab sample to determine compliance with primary maximum contaminant levels referenced above for inorganic chemicals, radionuclides, organic chemicals, and disinfection byproducts and with action levels for lead and copper referenced above. Compliance shall be based on the running-quarterly average, calculated each quarter using the previous four quarters of data. If the recycled water is out of compliance, a report shall be submitted to the DHS and SARWQCB that describes the reasons and the corrective actions taken.

Prior to the commencement of recharge via injection and/or spreading of recycled water, at least one 24-hour composite or grab sample of recycled water shall be collected and analyzed to determine compliance with primary maximum contaminant levels referenced above for inorganic chemicals, radionuclides, organic chemicals, and disinfection byproducts, and with action levels for lead and copper referenced above and to demonstrate the effectiveness of the treatment process. The results for the initial recycled water quality analysis shall be submitted to the DHS and SARWQCB.

Recycled water shall be monitored on an annual basis by analyzing a representative grab sample to determine compliance with secondary maximum contaminant levels listed above. If the single sample result (or average of samples collected during the year, if more than one) exceeds a secondary maximum contaminant level, a report shall be submitted to the DHS and SARWQCB that describes the reasons and corrective actions taken.

9. The total nitrogen concentration of the recycled water shall not exceed 5 mg/L as nitrogen. Total nitrogen shall be defined as the sum of ammonia, nitrite, nitrate, and organic nitrogen concentrations, expressed as nitrogen.

Compliance shall be based on the running average of all samples collected during the past 20 weeks. Each week two grab or 24-hour composite samples of recycled water shall be collected at least three days apart for total nitrogen analysis. If the 20-week average total nitrogen concentration exceeds 5 mg/L as nitrogen, recharge of recycled water shall be suspended until the total nitrogen concentration does not exceed 5 mg/L as nitrogen. Within seven days of the suspension, a report describing the causes of the failure and the corrective actions taken to avoid future violations of these requirements shall be submitted to the DHS and the SARWQCB.

If the average total nitrogen concentration in all samples of the recycled water collected for analysis exceeds 5 mg/L as nitrogen for more than two consecutive weeks, then a report describing the causes of the exceedance and the corrective actions taken to avoid future exceedances shall be submitted to the DHS and SARWQCB within 30 days.

If a single sample of recycled water for total nitrogen analysis exceeds 5 mg/L as nitrogen, a confirmation sample shall be collected and analyzed within 48 hours. If the average of the initial and confirmation samples exceeds 5 mg/L as nitrogen, an enhanced groundwater monitoring program shall be conducted at the closest downgradient monitoring well located one to three months underground travel time from the recharge operation. Weekly sampling and analysis for total nitrogen at the closest monitoring well shall begin four weeks prior to and continue until four weeks after the anticipated arrival time of the recycled water having the elevated total nitrogen level.

At the closest monitoring well, if the nitrite concentration exceeds 1 mg/L as nitrogen, or if the sum of the ammonia, nitrite, and organic nitrogen concentrations exceeds 3 mg/L as nitrogen, then the program shall be expanded to the next-closest downgradient monitoring well located three to four months underground travel time from the recharge operation. Weekly sampling and analysis for total nitrogen at the next-closest monitoring well shall continue until four weeks after the anticipated arrival time of the recycled water having the elevated total nitrogen level.

During the enhanced groundwater monitoring program at either the closest or next-closest monitoring well, if the sum of the ammonia, nitrite, and organic nitrogen concentrations does not exceed 3 mg/L as nitrogen, then normal groundwater monitoring as required in Condition Nos. 23 through 27 may resume.

During the enhanced groundwater monitoring program at the next-closest monitoring well, if the nitrite concentration exceeds 1 mg/L as nitrogen, or if the sum of the ammonia, nitrite, and organic nitrogen concentrations exceeds 3

mg/L as nitrogen, then weekly sampling and analysis for total nitrogen at the closest domestic well shall begin four weeks prior to and continue until four weeks after the anticipated arrival of the recycled water having the elevated total nitrogen level.

Within 30 days of conclusion of enhanced groundwater monitoring, a report summarizing the results of the enhanced groundwater monitoring program and describing the causes of the exceedance and corrective actions taken to avoid future violations of these requirements shall be submitted to the DHS and SARWQCB.

10. Diluent water shall be monitored quarterly for nitrate and nitrite. Within 48 hours of being informed by the laboratory of a nitrate and/or nitrite result greater than a maximum contaminant level, a confirmation sample shall be collected and analyzed. If the average of the initial and confirmation samples exceeds a maximum contaminant level, use of the diluent water shall be suspended and OCWD shall notify the DHS and SARWQCB within 48 hours of receiving the confirmation sample result. The causes of the exceedance shall be investigated and appropriate corrections shall be made before use of the diluent water may be resumed.

11. The Total Organic Carbon (TOC) concentration of the recycled water shall not exceed 0.5 mg/L divided by the DHS-specified maximum average RWC. Compliance shall be based on the running average of the most recent 20 samples. Each week one grab or 24-hour composite sample of the recycled water shall be collected for TOC analysis. Determination of compliance shall begin as soon as four samples have been collected, averaging all available samples up to 20 samples. After that time, compliance shall be determined monthly based on the most recent 20 TOC samples. The average of the most recent 20 samples shall be determined monthly. If the average TOC concentration exceeds 0.5 mg/L divided by the DHS-specified maximum average RWC, then recharge via injection and spreading of recycled water shall be suspended until the above TOC requirement can be met. Within seven days of the suspension, OCWD shall notify the DHS and SARWQCB.

    If the average of the last four recycled water samples exceeds the TOC concentration of 0.5 mg/L divided by the DHS-specified maximum average RWC, a report shall be submitted to DHS and the SARWQCB within 60 days that describes the reasons and the corrective actions that have been taken to avoid future occurrences.

12. The turbidity of the RO product water prior to disinfection shall not exceed 0.2 Nephelometric turbidity units (NTU) more than 5 percent of the time in any 24-hour period and shall not exceed 0.5 NTU at any time. The turbidity of the RO

product water shall be continuously measured with at least one reading every 1.2 hours and recorded. Compliance with the daily average turbidity shall be determined based on using the recorded turbidity taken at intervals of no more than 1.2 hours over a 24-hour period. Should the continuous turbidity meter and recorder fail, grab sampling at a minimum frequency of 1.2 hours may be substituted for a period of up to 24 hours. The results of the daily average turbidity determinations shall be reported quarterly to DHS and the SARWQCB. A failure to meet the turbidity performance requirements shall result in the suspension of injection of recycled water until such time that the cause of the failure has been identified and corrected. Any failure to meet the turbidity performance requirements shall be reported to the DHS and the SARWQCB in the next monthly report.

13. The recycled water intended for recharge via injection and spreading shall be disinfected such that the 7-day median number of total coliforms shall not exceed 2.2 total coliform bacteria per 100 milliliters (mL), and the number of total coliform organisms shall not exceed 23 total coliform bacteria per 100 mL in more than one sample in any 30-day period prior to injection or spreading. No sample shall exceed 240 total coliform bacteria per 100 mL. A grab sample shall be analyzed daily for total coliform bacteria. A failure to meet these requirements shall require the submission of a report describing the cause of the failure and the corrective actions taken to avoid future violations of these requirements. Failure to meet the 7-day median coliform requirement for two consecutive days shall result in the suspension of the injection of recycled water until such time the cause of the failure has been identified and corrected. Any failure to meet the total coliform requirements shall be reported to the DHS and SARWQCB in the next monthly report.

    UV irradiation following membrane filtration has been recognized by the DHS as an acceptable alternative disinfection method to chlorination to achieve at least 5-log inactivation of virus. UV disinfection shall comply with the "Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse" (December 2000) published by the National Water Research Institute (NWRI) which specify for RO permeate that: (1) the design UV dose shall be at least 50 millijoules per square centimeter (mJ/cm^2) under maximum day flow; (2) the effluent turbidity shall be equal to or less than 0.2 NTU 95 percent of the time, and not to exceed 0.5 NTU at any time; and (3) the RO permeate UV transmittance shall be 90 percent or greater at 254 nanometers (nm).

14. Each quarter during the first year of operation, samples of the recycled water shall be collected and analyzed as follows, and any positive results shall be reported to the DHS and SARWQCB in the next monthly report:

- Unregulated chemicals in Table 64450, Chapter 15, Title 22, CCR, Drinking Water Quality and Monitoring Requirements;
- Priority toxic pollutants (chemicals listed in the Water Quality Standards, Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California, and 40 CFR Part 131, Federal Register 65 (97), May 18, 2000, p. 31682); and
- The following chemicals with State action levels: N-nitrosodimethylamine (NDMA), 1,4-dioxane, and perchlorate.

After the first year of operation, the DHS may allow the monitoring frequency to be reduced to annually for the above chemicals based on the initial sample results.

15. Each year, OCWD shall collect and analyze samples of the recycled water for endocrine disrupting chemicals and pharmaceuticals specified by the DHS and using methods accepted by the DHS. The results of this monitoring shall be submitted to the DHS and SARWQCB annually.

16. Each year, OCWD shall collect samples of the recycled water and conduct a Tentatively Identified Chemicals (TIC) analysis. The results of this monitoring shall be submitted to the DHS and SARWQCB annually.

17. An operations, maintenance and monitoring plan (OMM Plan) shall be developed for the Interim WF-21 AWTF and submitted to the DHS and the SARWQCB for approval prior to startup of Interim WF-21. OCWD shall operate its Interim WF-21 facilities in accordance with the approved OMM Plan. After a year of operation, the Interim WF-21 OMM Plan shall be updated and submitted to the DHS and SARWQCB for review and approval. The updated Interim WF-21 OMM Plan shall be used as the basis for the GWR System AWTF OMM Plan.

    An OMM Plan shall be developed for the GWR System AWTF and submitted to the DHS and the SARWQCB for approval prior to startup of the GWR System. OCWD shall operate its GWR System facilities in accordance with the approved OMM Plan. After a year of operation, the GWR System OMM Plan shall be updated and submitted to the DHS and SARWQCB for review and approval.

    All OMM Plans shall cover critical operational parameters to include routine testing procedures for the MF, RO and AOP systems, optimization of the hydrogen peroxide dose, UV dose for disinfection, and all treatment processes, maintenance and calibration schedules for monitoring equipment, process alarm set points, and response procedures for alarms in each treatment process of the AWTF, including criteria for diverting recycled water if water quality requirements are not met, start-up, peak flow and emergency discharges to the Santa Ana

River, and emergency response and contingency plans. During the first year of operation of Interim WF-21 and the GWR System, all treatment processes shall be optimized to reduce contaminant levels. The results of these initial optimization efforts shall be incorporated into the updated OMM Plans. The OMM Plans shall include staffing levels with applicable certifications levels for AWTF operations personnel. Significant changes in the operation of any of the treatment processes shall be reported to the DHS and SARWQCB. Significant changes in the approved OMM Plans must be approved by the DHS and SARWQCB prior to instituting changes.

18. At the Talbert Gap Barrier, the recycled water shall be retained in the groundwater basin for a minimum of 12 months prior to being withdrawn at a domestic water supply well. A numerical model, tracer, or other method shall be used to determine the underground retention time and recycled water contribution to each aquifer. If a tracer is used, the tracer shall be determined prior to start-up.

19. At the Anaheim Forebay, the recycled water shall be retained in the groundwater basin for a minimum of 6 months prior to being withdrawn at a domestic water supply well. A numerical model, tracer, or other method shall be used to determine the underground retention time and recycled water contribution to each aquifer. If a tracer is used, the tracer shall be determined prior to start-up.

20. At the Talbert Gap Barrier, no domestic drinking water wells shall be allowed within a buffer zone defined by the area less than 2,000 feet and 12 months underground travel time from the Talbert Gap Barrier.

21. At the Anaheim Forebay, no domestic drinking water wells shall be allowed within a buffer zone defined by the area less than 500 feet and 6 months underground travel time from Kraemer/Miller Basins.

22. OCWD shall adopt a resolution that effectively prevents the use of groundwater for drinking water purposes within the area required to achieve 12 months underground retention time and 2,000 feet of horizontal separation from the Talbert Gap Barrier and within the area to achieve 6 months retention time and 500 feet of horizontal separation from the Kraemer/Miller Basins area. The resolution shall be invoked prior to the start of injection or spreading of recycled water from the GWR System. In addition, OCWD shall notify the Orange County Well Standards Advisory Board of its resolution to prevent construction of any domestic supply wells within these buffer zones.

23. Groundwater monitoring to detect the influence of the GWR System recharge via injection and spreading shall be performed. Monitoring wells shall be sited at locations within approximately three months underground travel time of each

recharge area and at additional intermediate points between each recharge area and the nearest downgradient domestic water supply well, and such that samples can be obtained independently from each aquifer potentially conveying the recharge water. Monitoring well locations shall be determined based on a numerical model, tracer, or other method to determine the estimated underground travel time from the recharge operation to the monitoring well sites. If a tracer is used, the tracer shall be determined prior to start-up.

24. At a minimum, three new multi-depth groundwater monitoring wells, M-45, M-46 and M-47, shall be constructed in Fountain Valley between the Talbert Gap Barrier injection wells and nearby domestic water supply wells. For the nearest domestic water supply well, MCWD-5, well M-46 shall be installed near the Santa Ana River approximately three to four months travel time from the barrier (approximately 700 feet), and well M-47 shall be installed approximately one-half of the distance (approximately 1,500 feet) between the barrier and MCWD-5. For both wells M-46 and M-47, samples shall be taken independently from the aquifers receiving the injection water as follows: (1) Lambda/Omicron Aquifer; (2) Upper Rho Aquifer; (3) Lower Rho Aquifer; and (4) Main Aquifer. A third new monitoring well, M-45, shall be constructed approximately one-half of the distance (about 2,800 feet) between the barrier and the Newport Beach production wells, NB-TAMS, NB-TAMD, NB-DOLS, and NB-DOLD. Two existing monitoring wells, M-10 and M-11, located approximately three months travel time from the barrier to these Newport Beach production wells, shall also be monitored. For M-45, M-10, and M-11, samples shall be taken independently from the aquifers receiving the injection water as follows: (1) Alpha; (2) Beta; (3) Lambda/Omicron; and (4) Main Aquifer.

25. At a minimum, one new multi-depth groundwater monitoring well, AMD-12, shall be constructed west of Kraemer/Miller Basins along the groundwater flow path toward domestic water supply well A-26 to monitor water quality in multiple zones of the Main Aquifer. Well AMD-12 shall be located approximately 2,600 feet away from the recharge operation, or about one-third of the distance (approximately three months travel time) between Kraemer/Miller Basins and well A-26. In addition, two existing monitoring wells, AM-7 and AM-8, located west of Kraemer/Miller Basins along the flow path toward well A-26, shall be regularly monitored. AMD-7 is located at about one-quarter of the distance (approximately 2 months travel time) between Kraemer/Miller Basins and well A-26. AM-8 is located at approximately one-half of the distance (approximately four months travel time) between Kraemer/Miller Basins and well A-26. After it is taken out of service, well SCWC-PLJ2, which is located about three-quarters of the distance (approximately six months travel time) between Kraemer/Miller Basins and well A-26, may be used for monitoring purposes. For the new monitoring well AMD-12, samples shall be taken independently from the Main Aquifer system receiving the recharge water at the following approximate

depths: (1) 300-350 feet; (2) 400-450 feet; (3) 550-650 feet; (4) 750-800 feet; and 900-1,000 feet. For existing monitoring wells AM-7, AM-8, and AMD-10, samples shall be taken independently from the Main Aquifer system receiving the recharge water at varying depths to track the travel and quality characteristics of the spreading operation.

26. The groundwater monitoring program shall be reviewed and modified every two years or sooner, based on results of the monitoring program. Changes to the monitoring program, including well locations, shall be approved by the DHS and SARWQCB.

27. Each quarter, at a minimum, samples shall be collected from the aquifers and at the depths listed above at each monitoring well and analyzed for the following:

    - TOC;
    - Total nitrogen;
    - Constituents and characteristics in CCR, Title 22, Chapter 15, Tables 64449-A and 64449-B;
    - Total coliform levels; and
    - Any water quality constituents specified by the DHS based on the results of the recycled water monitoring conducted pursuant to these analyses.

    If any of the monitoring results indicates that a maximum contaminant level has been exceeded or that coliforms are present, OCWD shall notify the DHS within 48 hours of receiving the results and make note of any positive findings in the monthly report submitted to the SARWQCB.

28. OCWD shall submit all water quality data for recycled water and groundwater monitoring in a format acceptable to the DHS and SARWQCB. Analytical results shall be reported to the DHS electronically using the Electronic Deliverable Format as defined in the Electronic Deliverable Format (EDF) Version 1.2i Guidelines and Restrictions dated April 2001 and Data Dictionary dated April 2001.

29. OCWD shall perform annually a mass balance to ensure that blending is occurring in the aquifer for the initial phase of operation. Injection and surface-spread recharge water flow paths will be determined annually from groundwater elevation contours and compared to the flow and transport model's flow paths. Assumptions for the model shall be revised if there are any significant changes to the Basin's injection, spreading, recharge, and extraction activities. The flow and transport model shall be updated to match as closely as possible the actual flow patterns observed within the aquifer if the flow paths have significantly changed.

30. During the initial 75 percent RWC operation period, OCWD shall submit annually a report to the DHS and SARWQCB evaluating the compliance with the minimum underground retention time, distance to the nearest point of extraction, blending, and the maximum RWC requirements. The annual report shall include water quality data on turbidity, coliforms, total nitrogen, regulated contaminants, TOC, and non-regulated contaminants compliance. The annual report shall also include a summary of corrective actions taken as a result of violations, suspensions of recharge, detections of monitored constituents and any observed trends, information on the travel of the recycled water (estimated location of the leading edge), description of any changes in operation of any unit processes or facilities, and description of any anticipated changes, including any impacts on other unit processes.

31. An independent advisory panel shall provide on-going periodic scientific peer review of the GWR System. Members of the advisory panel, at a minimum, shall include a toxicologist, an engineering geologist or hydrogeologist registered in California, an engineer registered in California and experienced in the fields of wastewater treatment and public water supply, a microbiologist, and a chemist.

32. OCWD shall review Title 22 drinking water quality data for the nearest domestic water supply wells in the vicinity of the GWR System and Interim WF-21 injection operation at Talbert Gap Barrier and in the vicinity of the GWR System spreading operation at the Anaheim Forebay, and shall immediately notify the DHS and the owner of the well to discontinue using the well if it no longer produces safe, wholesome, potable water as a result of the recycled water injection or spreading operation, and shall provide an alternative safe drinking water supply approved by the DHS.

33. OCWD shall submit an annual report of findings prepared by an independent, qualified engineer registered in California and experienced in the field of advanced wastewater treatment for groundwater recharge regarding the operation of the GWR System and Interim WF-21 facilities and the results of the monitoring and investigations of the impacts of recycled water injection at Talbert Gap Barrier and spreading at Anaheim Forebay.

34. OCWD shall update and submit the engineering report every five years to the DHS and SARWQCB.

35. Provided that OCWD meets all of the above conditions and findings of fact, notwithstanding subsequent deletion of any condition by the SARWQCB, the DHS finds that the GWR System and Interim WF-21 can provide injection recharge water and that the GWR System can provide spreading recharge water that will not degrade the groundwater basin as a source of water supply for domestic purposes.

Date	Cindy Forbes, P.E. Chief of the Southern California Branch Drinking Water Field Operations State of California Department of Health Services Hearing Officer

California Regional Water Quality Control Board
Santa Ana Region

MONITORING AND REPORTING PROGRAM NO. R8-2004-0002

for the

Orange County Water District

Interim Water Factory 21 and Groundwater Replenishment System
Groundwater Recharge and Reuse at
Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins

Orange County

State of California
California Regional Water Quality Control Board
Santa Ana Region

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Interim Water Factory 21 and Groundwater Replenishment System
Groundwater Recharge and Reuse at
Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins

Orange County

The Producer shall implement this monitoring and reporting program on the effective date of this Order.

I. *MONITORING REQUIREMENTS*

A. Sampling Requirements

1. Daily samples shall be collected on each day of the week.

2. Weekly samples shall be collected on a representative day of the week.

3. Monthly samples shall be collected on the 10th working day of the month.

4. Quarterly samples shall be collected on the 10th working day of January, April, July, and October.

5. Annual samples shall be collected on the 10th working day of the following months:

Year	Annual Sampling Month
2004-2007	July, October, January, April, respectively
2008-2011	August, November, February, May, respectively
2012-2016	September, December, March, June, respectively

B. Influent Monitoring for Treatment Facilities

1. Sampling stations shall be established and located upstream of any in-plant return flows and where a representative sample of the influent to the treatment facility from OCSD's Reclamation Plant No. 1 can be obtained. The date and time of sampling (as appropriate) shall be reported with the analytical values determined. The following shall constitute the influent monitoring program:

Monitoring Program for Influent Flow				
Parameter	***Sample Location***	***Units***	***Type of Sample***	***Minimum Frequency of Analysis***
Influent Flow	Screening Influent or Microfiltration Feed	*mgd*	Flow meter/Totalizer	continuous
pH	Microfiltration Feed	*pH units*	recorder	continuous
Electrical Conductivity	Microfiltration Effluent	*micromhos/cm*	recorder	"
BOD_5	Screening Influent	*mg/l*	24-hr composite	quarterly
Total Suspended Solids	Screening Influent	"	"	"
Oil and Grease	Screening Influent	"	grab	"

C. Recycled Water Monitoring:

1. Sampling station(s) shall be established where representative samples of recycled water can be obtained. Representative samples shall be collected and analyzed for the following parameters at frequencies specified herein:

Table I			
Chemical	***Units***	***Type of Sample***	***Minimum Frequency of Sampling and Analysis***
Total Recycled Water Flow	*mgd*	Flow meter/totalizer	continuous
Turbidity	*NTU*	"	continuous (see paragraph C.2., below)
Total Nitrogen[1]	*mg/l*	Grab[2]/composite	2/week[3]

[1] *Total Nitrogen is defined as the sum of nitrate, nitrite, ammonia, and organic nitrogen concentrations, expressed as nitrogen.*

Table I			
Chemical	***Units***	***Type of Sample***	***Minimum Frequency of Sampling and Analysis***
Total Organic Carbon	*mg/l*	Grab/composite	weekly
Total Coliform	*MPN/100ml*	grab	daily
pH	*pH units*	pH meter	continuous
Electrical Conductivity	*micromhos/cm*	grab	daily
Oil and Grease	*mg/l*	grab	quarterly
Inorganic Chemical			
Aluminum	*mg/l*	grab	quarterly
Antimony	"	"	"
Arsenic	"	"	"
Asbestos	"	"	"
Barium	"	"	"
Beryllium	"	"	"
Cadmium	"	"	"
Chromium	"	"	"
Cyanide	"	"	"
Fluoride	"	"	"
Mercury	"	"	"
Nickel	"	"	"
Selenium	"	"	"
Thallium	"	"	"
Volatile Organic Chemicals (VOC)			
Benzene	*mg/l*	grab	quarterly
Carbon Tetrachloride	"	"	"
1,2-Dichlorobenzene	"	"	"
1,4-Dichlorobenzene	"	"	"
1,1-Dichloroethane	"	"	"
1,2-Dichloroethane	"	"	"
1,1-Dichloroethylene	"	"	"
cis-1,2-Dichloroethylene	*mg/l*	grab	quarterly
trans-1,2-Dichloroethylene	"	"	"
Dichloromethane	"	"	"
1,2-Dichloropropane	"	"	"
1,3-Dichloropropene	"	"	"
Ethylbenzene	"	"	"
Monochlorobenzene	"	"	"
Styrene	"	"	"
1,1,2,2-Tetrachloroethane	"	"	"

[2] *Grab sample is an individual sample collected in a short period of time not exceeding 15 minutes. Grab samples shall be collected during normal peak loading conditions for the parameter of interest, which may or may not be during hydraulic peaks.*

[3] *Two samples shall be collected at least three days apart.*

Table I			
Chemical	***Units***	***Type of Sample***	***Minimum Frequency of Sampling and Analysis***
Tetrachloroethylene	"	"	"
Toluene	"	"	"
1,2,4-Trichlorobenzene	"	"	"
1,1,1Trichloroethane	"	"	"
1,1,2-Trichloroethane	"	"	"
Trichloroethylene	"	"	"
Trichlorofluoromethane	"	"	"
1,1,2-Trichloro-1,2,2-Trifluoroethane	"	"	"
Vinyl Chloride	"	"	"
Xylenes[4]	"	"	"
Non-Volatile Synthetic Organic Chemicals (SOCs)			
Alachlor	*mg/l*	grab	quarterly
Atrazine	"	"	"
Bentazon	"	"	"
Benzo(a)pyrene	"	"	"
Carbofuran	"	"	"
Chlordane	"	"	"
2,4-D	"	"	"
Dalapon	"	"	"
Dibromochloropropane (DBCP)	"	"	"
Di(2-ethylhexyl)adipate	"	"	"
Di(2-ethylhexyl)phthalate	"	"	"
Dinoseb	"	"	"
Diquat	"	"	"
Endothall	"	"	"
Endrin	*mg/l*	grab	quarterly
Ethylene Dibromide (EDB)	"	"	"
Glyphosate	"	"	"
Heptachlor	"	"	"
Heptachlor Epoxide	"	"	"
Hexachlorobenzene	"	"	"
Hexachlorocyclopentadiene	"	"	"
Lindane	"	"	"
Methoxychlor	"	"	"
Molinate	"	"	"
Oxamyl	"	"	"
Pentachlorophenol	*mg/l*	grab	quarterly

[4] *Limit is for either a single isomer or the sum of the isomers.*

Table I			
Chemical	***Units***	***Type of Sample***	***Minimum Frequency of Sampling and Analysis***
Picloram	*mg/l*	grab	quarterly
Polychlorinated Biphenyls	"	"	"
Simazine	"	"	"
Thiobencarb	"	"	"
Toxaphene	"	"	"
2,3,7,8-TCDD (Dioxin)	"	"	"
2,4,5-TP (Silvex)	"	"	"
Disinfection By-products			
Total Trihalomethanes (TTHM)	*mg/l*	grab	quarterly
Total Haloacetic acids (five) (HAA5)	"	"	"
Bromate	"	"	"
Chlorite	"	"	"
Action Levels			
Copper	*mg/l*	grab	quarterly
Lead	"	"	"
Unregulated Chemicals			
Boron	*mg/l*	grab	quarterly
Chromium-6	µg/*l*	"	"
Perchlorate	"	"	"
Vanadium	"	"	"
Dichlorodifluoromethane	"	"	"
Ethyl tertiary butyl ether	"	"	"
Tertiary amyl methyl ether	"	"	"
Tertiary butyl alcohol	"	"	"
1,2,3-Trichloropropane	µg/*l*	grab	quarterly
N-Nitrosodimethylamine (NDMA)	µg/*l*	grab	quarterly
1,4-Dioxane	"	"	"
Remaining priority pollutants	*mg/l*	grab	See paragraph C.3., below.
Endocrine disrupting chemicals & pharmaceuticals	"	"	Quarterly See paragraph C.4., below
Tentatively Identified Chemicals (TIC)	"	"	Annually

Radionuclides	**Units**	**Type of Sample**	**Minimum Frequency of Sampling and Analysis**
Combined Radium-226 and Radium-228	*pCi/l*	grab	quarterly
Gross Alpha particle activity (including Radium-226 but excluding Radon and Uranium)	"	"	"
Tritium	"	"	"
Strontium-90	"	"	"
Gross Beta particle activity	"	"	"
Uranium	"	"	"

Table II	Units	Type of Sample	Minimum Frequency of Sampling and Analysis
Constituents			
Aluminum	*mg/l*	grab	Annually
Color	*unit*	"	Annually
Copper	*mg/l*	"	"
Corrosivity	"	"	"
Foaming Agents (MBAS)	"	"	"
Iron	"	"	"
Manganese	*mg/l*	grab	annually
Methyl-*tert*-butyl ether (MTBE)	"	"	"
Odor—Threshold	"	"	"
Silver	"	"	"
Thiobencarb	"	"	"
Turbidity	*NTU*	on-line	continuous
Zinc	"	"	"

Table III	Units	Type of Sample	Minimum Frequency of Sampling and Analysis
Total Dissolved Solids	*mg/l*	grab	Monthly
Nitrate nitrogen	"	"	"
Hardness	"	"	"
Sodium	"	"	"
Chloride	"	"	"
Sulfate	"	"	"

2. Turbidity shall be measured and recorded continuously and immediately before disinfection with at least one reading every 1.2 hours. Should the continuous turbidity meter and recorder fail, grab sampling at a minimum frequency of 1.2 hours may be substituted for a period of up to 24 hours.

3. Remaining priority pollutants are those pollutants listed in the California Toxics Rule (See Attachment "A" of this monitoring and reporting program) but is not specifically listed in this Table. Quarterly sampling and testing shall be done.

4. During the first two years of start up of operation of Interim WF 21 and GWRS, recycled water samples shall be collected and analyzed quarterly for endocrine disrupting chemicals and pharmaceuticals specified by the CDHS and using methods accepted by the CDHS. The results of this monitoring shall be submitted to the CDHS and the Regional Board quarterly. After two years operation of either the Interim WF 21 or GWRS, the quarterly monitoring program shall be reduced to annually upon the approval of CDHS and Regional Board's Executive Officer.

5. The Producer shall submit a quarterly report, in a tabular form, during the quarter for the amount of recharged water injected into Talbert Gap Barrier and/or spreading into Kraemer/Miller Basins. The quarterly report shall include any non-compliance events, which occurred at the individual recharge sites during the reporting period. A summary of these data shall be included in the annual report. The annual report shall be periodically reviewed by an independent advisory panel. (See also Provision J.18. of the Order)

D. Diluent Water Monitoring

1. Sampling station(s) shall be established where representative samples of diluent water can be obtained. Representative samples shall be collected and analyzed for the following parameters at frequencies specified herein:

Monitoring Program for Diluent Water				
Parameter	**Sample Station**	**Units**	**Type of Sample**	**Minimum Frequency of Analysis**
Diluent water flow	Before blending	*mgd*	Flow Meter/Totalizer	continuous
Nitrate and nitrite	"	*mg/l*	Grab	see paragraph D.2., below

2. Diluent water shall be monitored quarterly for nitrate and nitrite. Within 48 hours of being informed by the laboratory of a nitrate and/or nitrite result greater than a MCL[5], a confirmation sample shall be collected and analyzed. If the average of the initial and confirmation samples exceeds a MCL, use of the diluent water shall be suspended.

E. Groundwater Monitoring Program

1. Representative samples shall be taken at the following groundwater monitoring wells at depths heretofore specified.

   a. For the new monitoring well AMD-12[6], samples shall be taken independently from the principal aquifer system receiving the recharge water at the following approximate depths: (1) 300-350 feet; (2) 400-450 feet; (3) 550-650 feet; (4) 750-800 feet; and (5) 900-1,000 feet.

   b. For existing monitoring wells AM-7[7], AM-8[8], and AMD-10[9], samples shall be taken independently from the principal aquifer system receiving the recharge water at varying depths to track the travel and quality characteristics of the spreading operation.

   c. For both wells M-46[10] and M-47, samples shall be taken independently from the aquifers receiving the injection water as follows: (1) Lambda/Omicron Aquifer; (2) Upper Rho Aquifer; (3) Lower Rho Aquifer; and (4) Main Aquifer. For wells M-45, M-10, and M-11, samples shall be taken independently from the aquifers receiving the injection water as follows: (1) Alpha; (2) Beta; (3) Lambda/Omicron; and (4) Main Aquifer.

2. Samples shall be tested and analyzed for constituents specified herein**:**

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5 *Maximum Contaminant Level. MCL for nitrite (as nitrogen) is 1 mg/L. MCL for nitrate (as nitrogen) is 10 mg/L.*

6 *This is a new multi-depth groundwater monitoring well. AMD-12, shall be constructed west of Kraemer/Miller Basins along the groundwater flow path toward domestic water supply well A-26 to monitor water quality in multiple zones of the Main Aquifer. Well AMD-12 shall be located approximately 2,600 feet away from the recharge operation, or about one-third of the distance (approximately three months travel time) between Kraemer/Miller Basins and well A-26.*

7 *AMD-7 is located at about one-quarter of the distance (approximately 2 months travel time) between Kraemer/Miller Basins and well A-26.*

8 *AM-8 is located at approximately one-half of the distance (approximately four months travel time) between Kraemer/Miller Basins and well A-26*

9 *Well AMD-10 is located immediately west of Kraemer/Miller Basin.*

10 *One of three new multi-depth monitoring wells, M-45 through M-47, that will be constructed for the GWRS in Fountain Valley between the Talbert Gap Barrier injection wells and the nearest domestic water supply wells. Wells M-46 and M-47 will be installed near the Santa Ana River approximately three to four months travel time and one-half the distance (about 700 and 1,500 feet from the barrier), respectively, to the nearest domestic water supply well, MCWD-5. Wells M-46 and M-47 will sample the Lambda/Omicron, Upper Rho, Lower Rho, and Main Aquifers.*

Parameter	**Units**	**Type of Sample**	**Minimum Frequency of Analysis**
Total Nitrogen	*mg/l*	grab	quarterly
Total Organic Carbon	"	"	"
Total Coliform	*MPN/100ml*	"	"
pH	*pH units*	"	"
Electrical Conductivity	*micromhos/cm*	"	"
Aluminum	*mg/l*	"	"
Color	*Units*	"	"
Copper	*mg/l*	"	"
Corrosivity	*units*	"	"
Foaming Agents (MBAS)	*mg/l*	"	"
Iron	"	"	"
Manganese	"	"	"
Methyl-*tert*-butyl ether (MTBE)	"	"	"
Odor—Threshold	*Units*	"	"
Silver	*mg/l*	"	"
Thiobencarb	*mg/l*	grab	quarterly
Turbidity	*NTU*	"	"
Zinc	*mg/l*	"	"
Total Dissolved Solids	"	"	"
Chloride	"	'	"
Hardness	"	"	"
Nitrate nitrogen	"	"	"
Sodium	"	"	"
Sulfate	"	"	"
Water Quality Constituents[11]	"	"	"

3. If any of the groundwater monitoring test results indicates that a maximum contaminant level has been exceeded or that coliform are present, the producer shall notify the CDHS within 48 hours of receiving confirmed results and make note of any positive findings in the monthly report submitted to the Regional Board.

4. The groundwater monitoring program shall be reviewed and modified every two years or sooner, based on results of the monitoring program. The groundwater monitoring shall be periodically reviewed by an independent advisory panel. Changes to the monitoring program, including well locations, shall be approved by the CDHS and Regional Board.

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[11] *Any water quality constituents specified by the CDHS based on the results of the recycled water monitoring in Section C., above.*

II. ***REPORTING REQUIREMENTS***

The producer shall submit the reports identified to this Regional Board.

A. Quarterly Monitoring Reports

1. Monitoring reports shall be submitted quarterly and received at the Regional Board by the 15th day of the second month following the end of the quarterly monitoring period:

Reporting Period	Report Due Date
January – March	May 15th
April – June	August 15th
July – September	November 15th
October – December	February 15th

2. If no reclaimed water was delivered for injection and/or spreading during the quarter, the report shall so state.

3. Each quarterly monitoring report shall include, at a minimum, the following:

   a. All monitoring results for influent to the Interim WF 21 and GWR System (facilities) from OCSD's Reclamation Plant No. 1, recycled water produced from the facilities, diluents, recharged water with or without blending with diluents prior to injection and/or spreading, and groundwater.

   b. Records of any operational problems, plant upset and equipment breakdowns or malfunctions, and any diversion(s) of off-specification recycled water and the location(s) of final disposal.

   c. All corrective or preventive action(s) taken.

   d. A certification by the producer that no groundwater has been pumped from the zone that extends 2,000 feet from the injection wells that comprise the Talbert Gap Barrier for domestic water supply use.

   e. A certification by the producer that no groundwater has been pumped from the zone that extends 500 feet from the spreading basin(s) where recycled water is applied for domestic water supply use.

   f. The name and address of the hauler(s) of any waste hauled off-site, along with quantities hauled during the quarter, and the location of the final point of disposal. If no wastes are hauled during the reporting period, the producer shall make a statement to that effect.

g. The Regional Board may request supporting documentation, such as daily logs of operations.

B. Annual Monitoring Reports

1. By March 1 of each year, the Producer shall submit an annual report to the Board. The report shall contain both tabular and graphical summaries of the monitoring data obtained during the previous calendar year. The Producer shall discuss the compliance record and a summary of corrective actions taken as a result of violations, suspensions of recharge, detections of monitored constituents and any observed trends, information on the travel of the recycled water, description of any changes in operation of any unit processes or facilities, and description of any anticipated changes, including any impacts on other unit processes.

2. The annual report shall also include the following:

a. A list of the analytical methods employed for each test and associated laboratory quality assurance/quality control procedures. The report shall restate, for the record, the laboratories used by the Producer to monitor compliance with this Order and their status of certification. Upon request by Regional Board staff, the Producer shall also provide a summary of performance.

b. A mass balance to ensure that blending is occurring in the aquifer for the initial phase of operation. Injection and surface spreading recharge water flow paths will be determined annually from groundwater elevation contours and compared to the flow and transport model's flow paths.

c. A summary of corrective actions taken as a result of violations, suspensions of recharge, detections of monitored constituents and any observed trends, information on the travel of the recycled water (estimated location of the leading edge), description of any changes in operation of any unit processes or facilities, and description of any anticipated changes, including any impacts on other unit processes.

d. A summary of calibration records for equipments, such as pH meters, flow meters, turbidity meters, and logs of UV dose and RO permeate UV transmittance.

e. A summary discussion on whether domestic drinking water wells extracted water within the buffer zone defined by the area less than 2,000 feet and 12 months underground travel time from the Talbert Gap Barrier, including the actions/measures that were undertaken to prevent reoccurrence. If there were none, a statement to that effect shall be written.

f. A summary discussion on whether domestic drinking water wells extracted water within the buffer zone defined by the area less than 500 feet and 6 months underground travel time from Kraemer/Miller Basins, including the actions/measures that were undertaken to prevent reoccurrence. If there were none, a statement to that effect shall be written.

g. The annual report shall address operator certification and provide a list of current operating personnel and their grade of certification. The report shall also include the date of the facility's Operation and Maintenance Management Plan (OMMP), the date the plan was last reviewed, and whether the plan is complete and valid for the current facilities.

3. During the initial 75 percent RWC operation period, for at least one year after the blended recharged water has reached at least one monitoring well, the producer shall submit a report to the CDHS and Regional Board evaluating the compliance with the minimum underground retention time, distance to the nearest point of extraction, blending, and the maximum RWC requirements. The annual report shall include water quality data on turbidity, coliform, total nitrogen, regulated contaminants, TOC, and non-regulated contaminants compliance.

4. The producer shall submit an annual report of findings prepared by an independent qualified engineer registered in California and experienced in the field of advanced wastewater treatment for groundwater recharge regarding the operation of the GWRS and Interim WF 21 facilities and the results of the monitoring and investigations of the impact of recycled water injection at Talbert Gap Barrier and spreading at Kraemer/Miller Basins. The annual report shall be periodically reviewed by an independent advisory panel. (see also Provisions J.18. of the Order)

C. Five Years Engineering Report

The producer shall submit an updated engineering report every five years to the CDHS and Regional Board.

D. General Monitoring and Reporting Requirements

1. All chemical and bacteriological analyses shall be conducted at a laboratory certified for such analyses by the California Department of Health Services Environmental Laboratory Accreditation Program (ELAP) or approved by the Executive Officer. A copy of the laboratory certification shall be submitted with the annual summary report.

2. Recycled water samples must be analyzed within allowable holding time limits as specified in 40 CFR Part 136.3. All QA/QC analyses must be run on the same dates when samples were actually analyzed. The Producer shall make available for inspection and/or submit the QA/QC documentation upon request by Regional Board staff. Proper chain of custody procedures must be followed and a copy of that documentation shall be furnished upon request by Regional Board staff.

3. The Producer shall submit all water quality data for recycled water and groundwater monitoring in a format acceptable to the CDHS and the Regional Board. Analytical results shall be reported to the CDHS electronically using the Electronic Deliverable Format as defined in the Electronic Deliverable Format (EDF) Version 1.2i Guidelines and Restrictions dated April 2001 and Data Dictionary dated April 2001.

4. The producer shall perform annually a mass balance to ensure that blending is occurring in the aquifer for the initial phase of operation. Injection and surface-spread recharge water flow paths will be determined annually from groundwater elevation contours and compared to the flow and transport model's flow paths. Assumptions for the model shall be revised if there are any significant changes to the Basin's injection, spreading, recharge, and extraction activities. The flow and transport model shall be updated to match as closely as possible the actual flow patterns observed within the aquifer if the flow paths have significantly changed.

5. The Producer shall summarize and arrange the monitoring data in tabular form to demonstrate compliance with requirements.

6. For every item where the requirements are not met, the Producer shall submit a statement of the actions undertaken or proposed which will bring the recycled water into full compliance with requirements at the earliest possible time, and submit a timetable for implementation of the corrective measures.

7. Monitoring reports shall be signed by either the principal Executive Officer or ranking elected official. A duly authorized representative of the aforementioned signatories may sign documents if:

    a. The authorization is made in writing by the signatory;
    b. The authorization specifies the representative as either an individual or position having responsibility for the overall operation of the regulated facility or activity; and
    c. The written authorization is submitted to the Executive Officer of this Regional Board.

8. The monitoring report shall contain the following completed declaration:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments thereto; and that, based on my inquiry of the individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Executed on the _____day of_____at _____
_____Signature
_____Title

9. The Producer shall retain records of all monitoring information, including all calibration and maintenance, monitoring instrumentation, and copies of all reports required by this Order, for a period of at least three (3) years from the date of sampling measurement, or report. This period may be extended by request of the Regional Board or the CDHS at any time and shall be extended during the course of any unresolved litigation regarding the regulated activity.

10. Records of monitoring information shall include:

    a. The date, exact place, and time of sampling or measurements;
    b. The individual(s) who performed the sampling or measurements;
    c. The date(s) analyses were performed;
    d. The individual(s) who performed the analysis;
    e. The analytical techniques or methods used; and
    f. The results of such analyses.

11. The Producer shall submit to the Regional Board, together with the first monitoring report required by this Order, a list of all chemicals and proprietary additives which could affect the quality of the recycled water, including quantities of each. Any subsequent changes in types and/or quantities shall be reported promptly. An annual summary of the quantities of all chemicals, listed by both trade and chemical names, which are used in the treatment processes shall be included in the annual report.

Ordered by_____
Gerard J. Thibeault
Executive Officer

March 12, 2004

EPA PRIORITY POLLUTANT LIST

Metals		Acid Extractibles		Base/Neutral Extractibles (continuation)	
1.	Antimony	45.	2-Chlorophenol	91.	Hexachloroethane
2.	Arsenic	46.	2,4-Dichlorophenol	92.	Indeno (1,2,3-cd) Pyrene
3.	Beryllium	47.	2,4-Dimethylphenol	93.	Isophorone
4.	Cadmium	48.	2-Methyl-4,6-Dinitrophenol	94.	Naphthalene
5a.	Chromium (III)	49.	2,4-Dinitrophenol	95.	Nitrobenzene
5b.	Chromium (VI)	50.	2-Nitrophenol	96.	N-Nitrosodimethylamine
6.	Copper	51.	4-Nitrophenol	97.	N-Nitrosodi-N-Propylamine
7.	Lead	52.	3-Methyl-4-Chlorophenol	98.	N-Nitrosodiphenylamine
8.	Mercury	53.	Pentachlorophenol	99.	Phenanthrene
9.	Nickel	54.	Phenol	100.	Pyrene
10.	Selenium	55.	2, 4, 6 – Trichlorophenol	101.	1,2,4-Trichlorobenzene
11.	Silver	**Base/Neutral Extractibles**		**Pesticides**	
12.	Thallium	56.	Acenaphthene	102.	Aldrin
13.	Zinc	57.	Acenaphthylene	103.	Alpha BHC
Miscellaneous		58.	Anthracene	104.	Beta BHC
14.	Cyanide	59.	Benzidine	105.	Delta BHC
15.	Asbestos (not required unless requested)	60.	Benzo (a) Anthracene	106.	Gamma BHC
16.	2,3,7,8-Tetrachlorodibenzo-P-Dioxin (TCDD)	61.	Benzo (a) Pyrene	107.	Chlordane
Volatile Organics		62.	Benzo (b) Fluoranthene	108.	4, 4' - DDT
17.	Acrolein	63.	Benzo (g,h,i) Perylene	109.	4, 4' - DDE
18.	Acrylonitrile	64.	Benzo (k) Fluoranthene	110.	4, 4' - DDD
19.	Benzene	65.	Bis (2-Chloroethoxy) Methane	111.	Dieldrin
20.	Bromoform	66.	Bis (2-Chloroethyl) Ether	112.	Alpha Endosulfan
21.	Carbon Tetrachloride	67.	Bis (2-Chloroisopropyl) Ether	113.	Beta Endosulfan
22.	Chlorobenzene	68.	Bis (2-Ethylhexyl) Phthalate	114.	Endosulfan Sulfate
23.	Chlorodibromomethane	69.	4-Bromophenyl Phenyl Ether	115.	Endrin
24.	Chloroethane	70.	Butylbenzyl Phthalate	116.	Endrin Aldehyde
25.	2-Chloroethyl Vinyl Ether	71.	2-Chloronaphthalene	117.	Heptachlor
26.	Chloroform	72.	4-Chlorophenyl Phenyl Ether	118.	Heptachlor Epoxide
27.	Dichlorobromomethane	73.	Chrysene	119.	PCB 1016
28.	1,1-Dichloroethane	74.	Dibenzo (a,h) Anthracene	120.	PCB 1221
29.	1,2-Dichloroethane	75.	1,2-Dichlorobenzene	121.	PCB 1232
30.	1,1-Dichloroethylene	76.	1,3-Dichlorobenzene	122.	PCB 1242
31.	1,2-Dichloropropane	77.	1,4-Dichlorobenzene	123.	PCB 1248
32.	1,3-Dichloropropylene	78.	3,3'-Dichlorobenzidine	124.	PCB 1254
33.	Ethylbenzene	79.	Diethyl Phthalate	125.	PCB 1260
34.	Methyl Bromide	80.	Dimethyl Phthalate	126.	Toxaphene
35.	Methyl Chloride	81.	Di-n-Butyl Phthalate		
36.	Methylene Chloride	82.	2,4-Dinitrotoluene		
37.	1,1,2,2-Tetrachloroethane	83.	2-6-Dinitrotoluene		
38.	Tetrachloroethylene	84.	Di-n-Octyl Phthalate		
39.	Toluene	85.	1,2-Dipenylhydrazine		
40.	1,2-Trans-Dichloroethylene	86.	Fluoranthene		
41.	1,1,1-Trichloroethane	87.	Fluorene		
42.	1,1,2-Trichloroethane	88.	Hexachlorobenzene		
43.	Trichloroethylene	89.	Hexachlorobutadiene		
44.	Vinyl Chloride	90.	Hexachlorocyclopentadiene	Revised: 7/7/2000	